



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 7  
CERTIFICATION TEST REPORT**

**FOR**

**WIRELESS LAN MODULE**

**MODEL NUMBER: LBWA1WPKV6**

**FCC ID: VPYLBKV**

**IC: 772C-LBKV**

**REPORT NUMBER: 07J11366-1, REVISION C**

**ISSUE DATE: NOVEMBER 7, 2007**

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**NVLAP LAB CODE 200065-0**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	10/31/07	Initial Issue	Hsin Fu Shih
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C	11/07/07	Replaced 6dB BW low channel plot on page 29	V. Tran

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** MURATA MANUFACTURING COMPANY, LTD.  
10-1, HIGASHIKOTARI 1 - CHOME  
NAGAOKAKYO-SHI, KYOTO 617-8555  
JAPAN

**EUT DESCRIPTION:** WIRELESS LAN MODULE

**MODEL:** LBWA1WPKV6

**SERIAL NUMBER:** BBB0 & B7B4

**DATE TESTED:** OCTOBER 10 TO OCTOBER 29, 2007

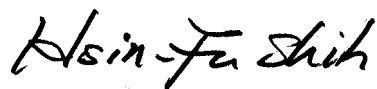
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C and Subpart E	No Non-Compliance Noted
RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2	No Non-Compliance Noted

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



HSIN FU SHIH  
ENGINEERING SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

VIEN TRAN  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11b/g/ transceiver wireless LAN module.

The radio module is manufactured by Komatsu Murata Manufacturing Co., Ltd and Fukui Murata Manufacturing Co., Ltd.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2472	802.11b	2.46	1.76
2412 - 2472	802.11g	4.89	3.08

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two different antenna types. These are Sleeve (Mitsumi Electric Co., Ltd / DCA-P02) with gain of -0.73 dBi and Monopole (Yichang Hsiang Industrial Co., Ltd / R-AN2400-5701RS) with gain of 2.67 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was MurataArt - NOK, rev. 1.0.1.

The test utility software used during testing was DS-ART, rev. 1.0 built 10.

### 5.5. WORST-CASE CONFIGURATION AND MODE

For b and g mode all data were taken at 1Mb/s and 6Mb/s respectively. And the worst-case channel is determined as the channel with the highest output power.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	PP17L	N/A	E2KWM3945ABG
AC adapter	Dell	PA-1650-06D3	N/A	N/A
AC adapter	Unifive	US318-05	608-2835165	N/A
Platform	Murata	EZ271	N/A	N/A
Extended Board	Murata	P2RF8275	N/A	N/A
DC Power Supply	HP	E3610A	N/A	N/A
DC Power Supply	Xantrex	XHR 60-18	N/A	N/A

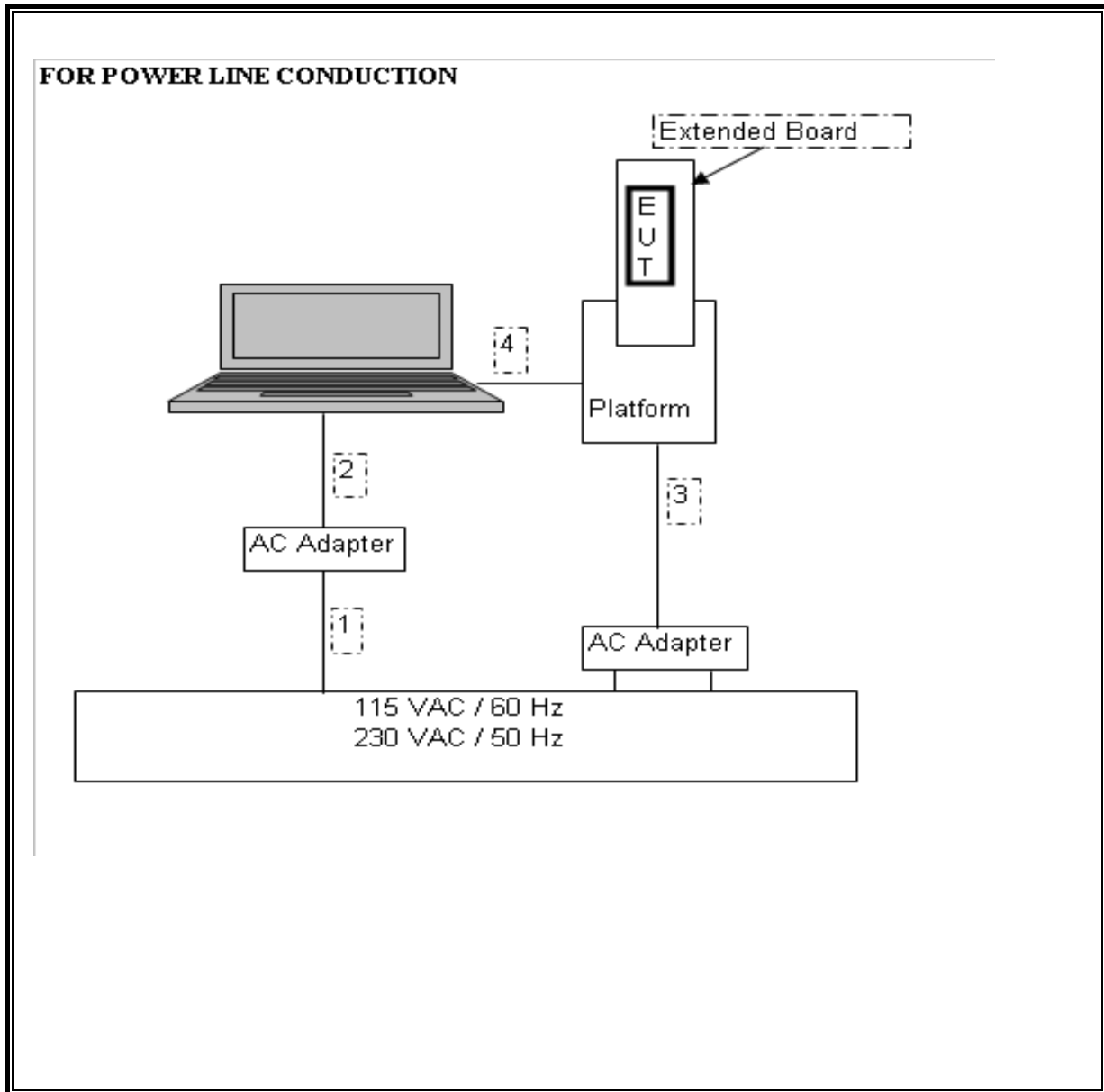
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115	Un-shielded	0.90m	For laptop
2	DC	1	DC	Un-shielded	1.85m	For laptop
3	DC	1	DC	Un-shielded	1.80m	For platform
4	RS-232C	1	Serial I/F	Shielded	3.10m	From laptop to platform
5	DC	1	DC	Un-shielded	1.25m	3.3 VDC to EUT
6	DC	1	DC	Un-shielded	1.25m	1.8 VDC to EUT

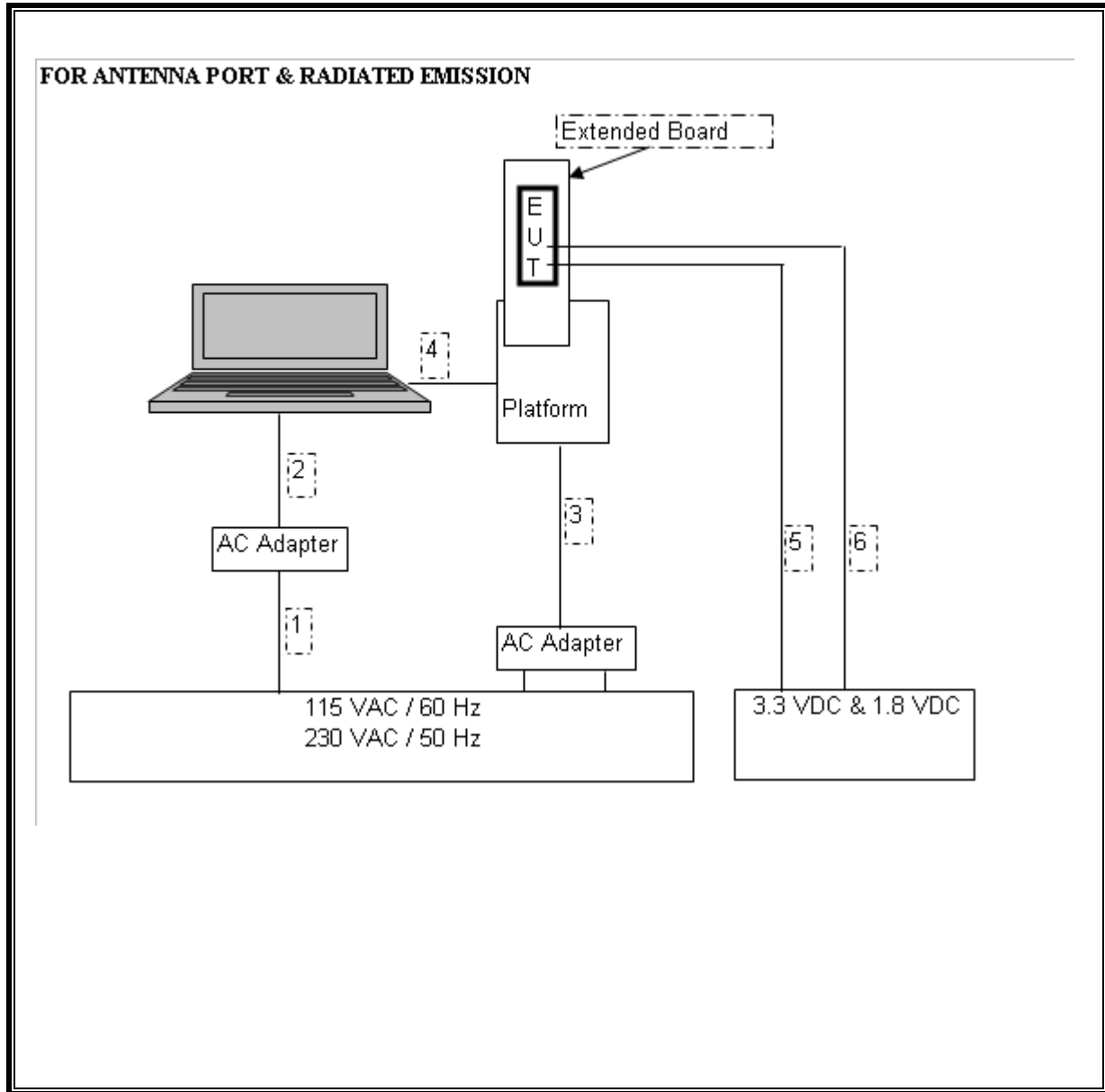
### TEST SETUP

During the testing process the EUT was connected to the PC via platform and extender card and the software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**







## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer	HP	E4446A	US42510266	10/18/2008
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/15/08
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	10/3/08
Peak Power Meter	Agilent	E4416A	GB41291160	12/2/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/07
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	10/13/08
Quasi-Peak Adaptor	HP	85650A	3145A01654	1/21/08
SA Display Section 2	HP	85662A	2816A16696	4/7/08
SA RF Section, 1.5 GHz	HP	85680B	2814A04227	1/7/08
Preamp 30-1000MHz	Sonoma	310N	185623	1/20/08
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	9/15/08
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	9/15/08
EMI Test Receiver	R & S	ESHS 20	827129/006	1/27/08

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 802.11b MODE IN THE 2.4 GHz BAND

#### 7.1.1. 6 dB BANDWIDTH

##### LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

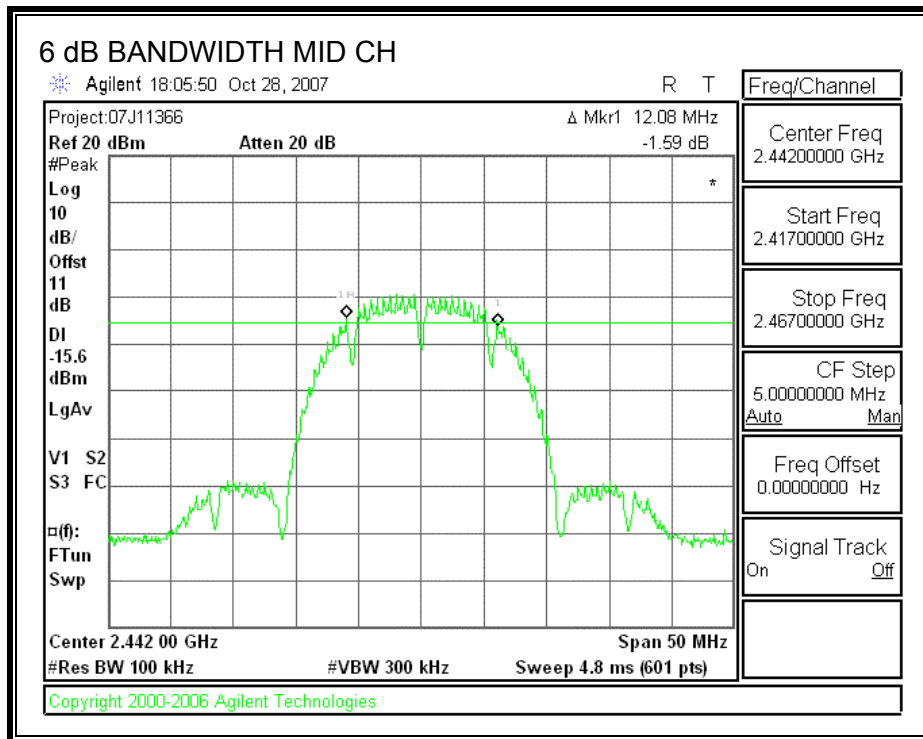
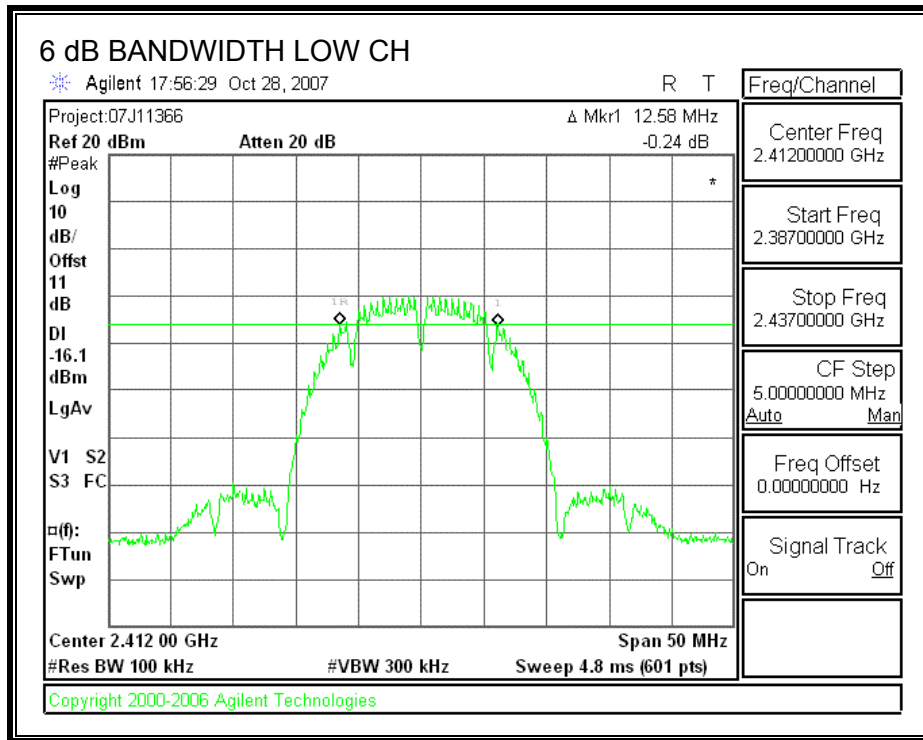
##### TEST PROCEDURE

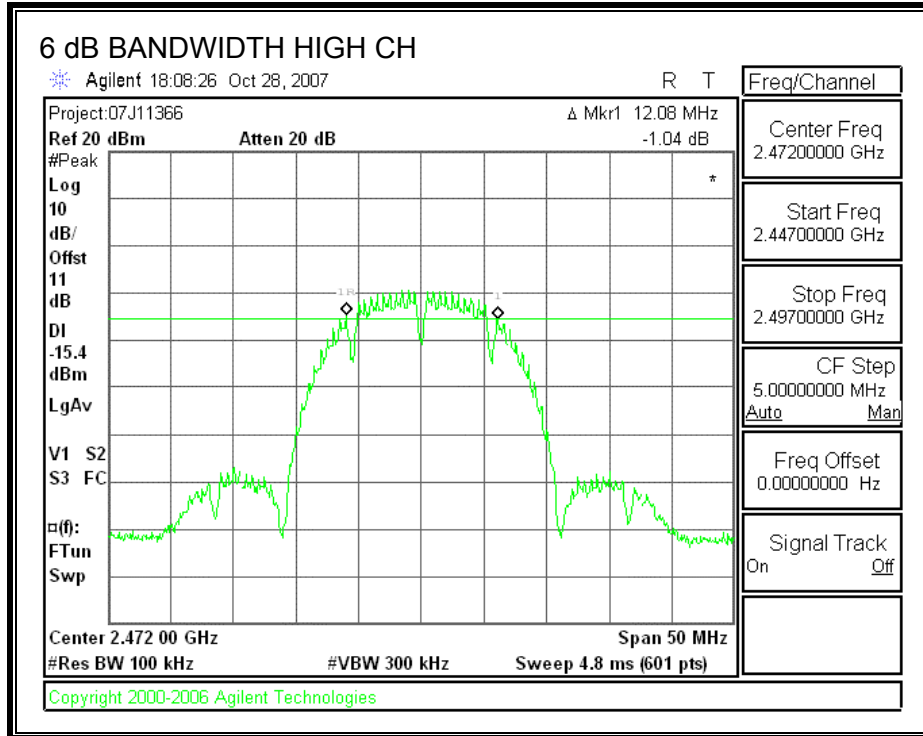
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	12.58	0.5
Middle	2442	12.08	0.5
High	2472	12.08	0.5

**6 dB BANDWIDTH**





### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

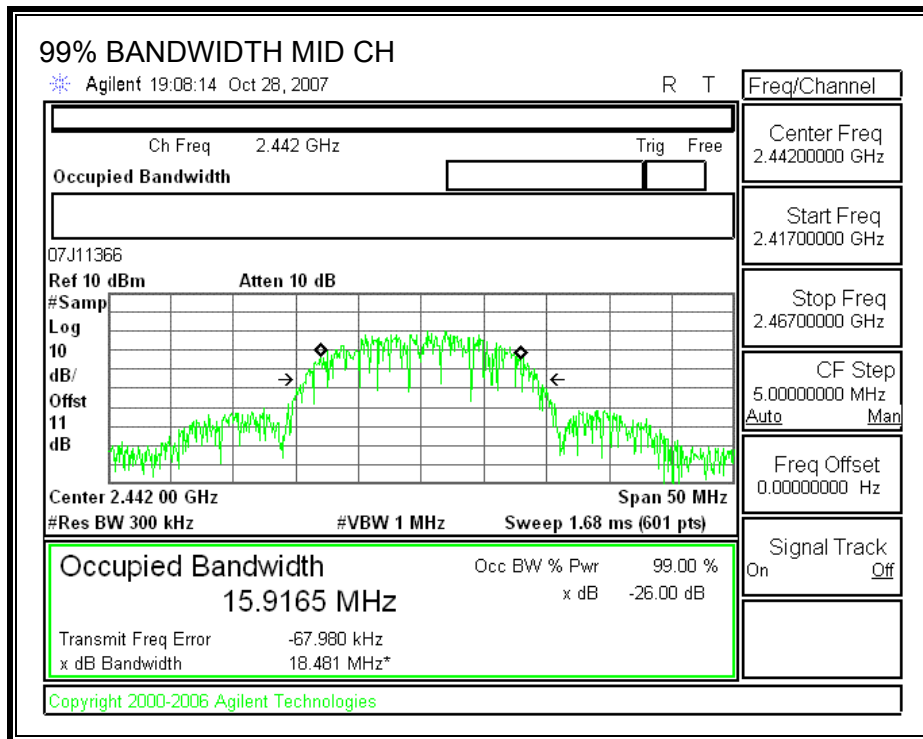
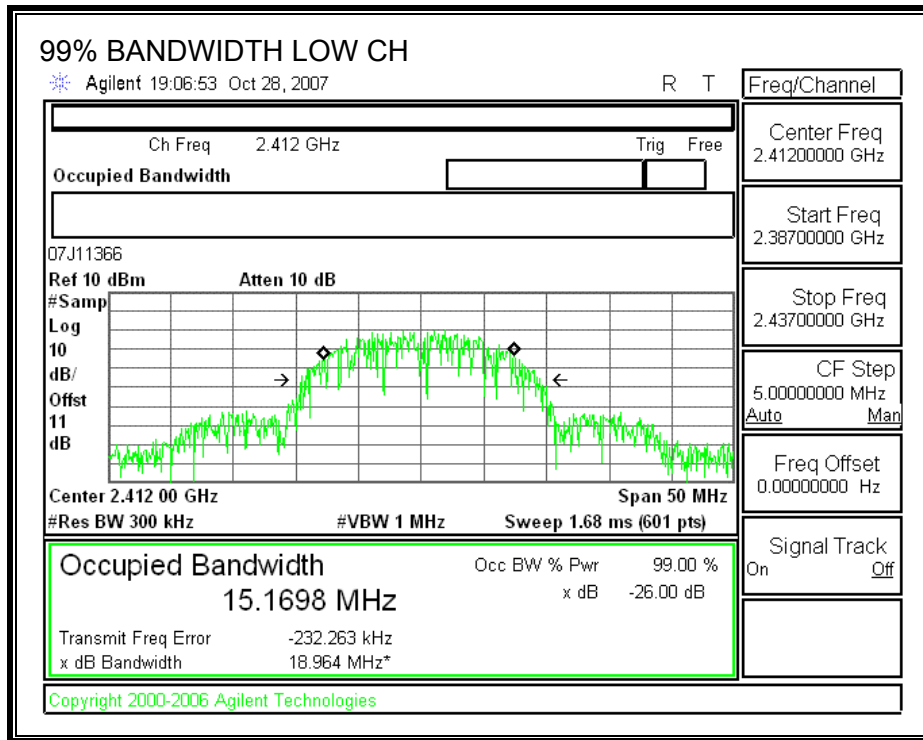
#### TEST PROCEDURE

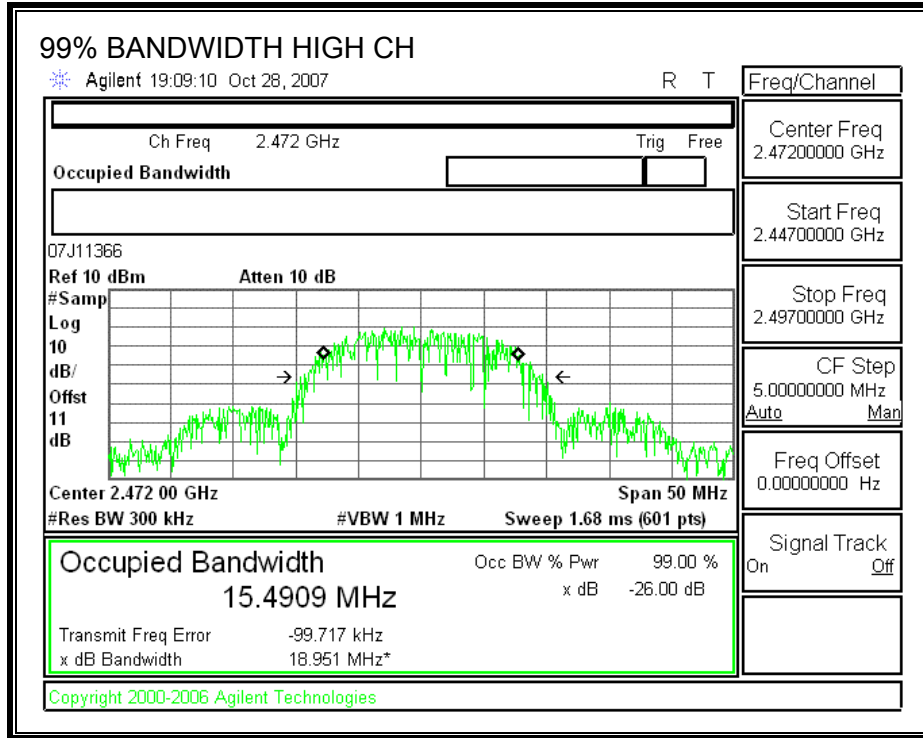
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.1698
Middle	2442	15.9165
High	2472	15.4909

**99% BANDWIDTH**







### 7.1.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b) (1)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

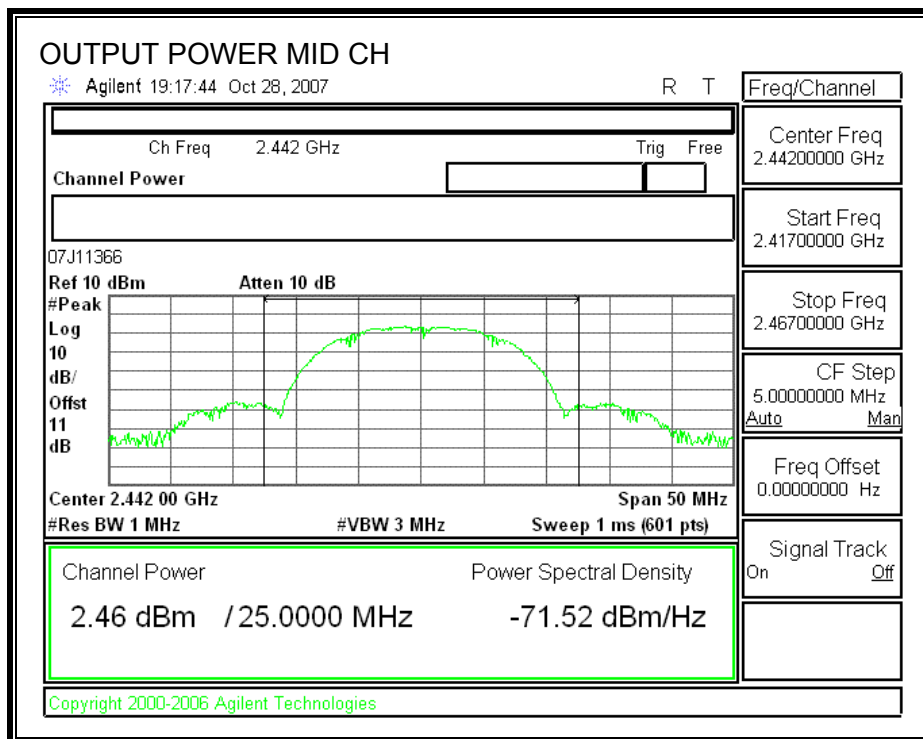
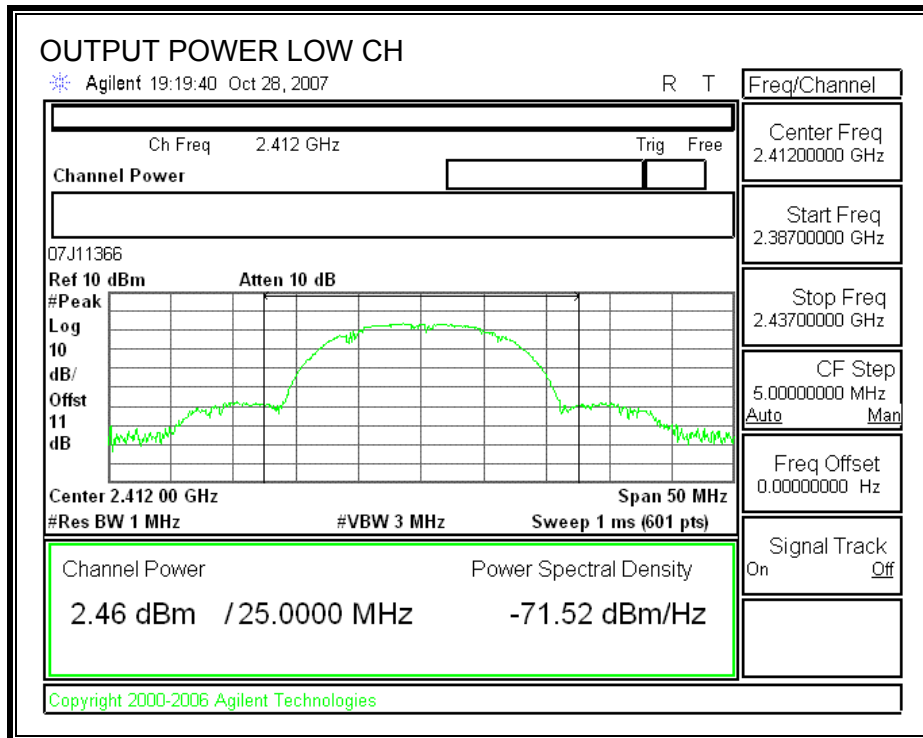
#### TEST PROCEDURE

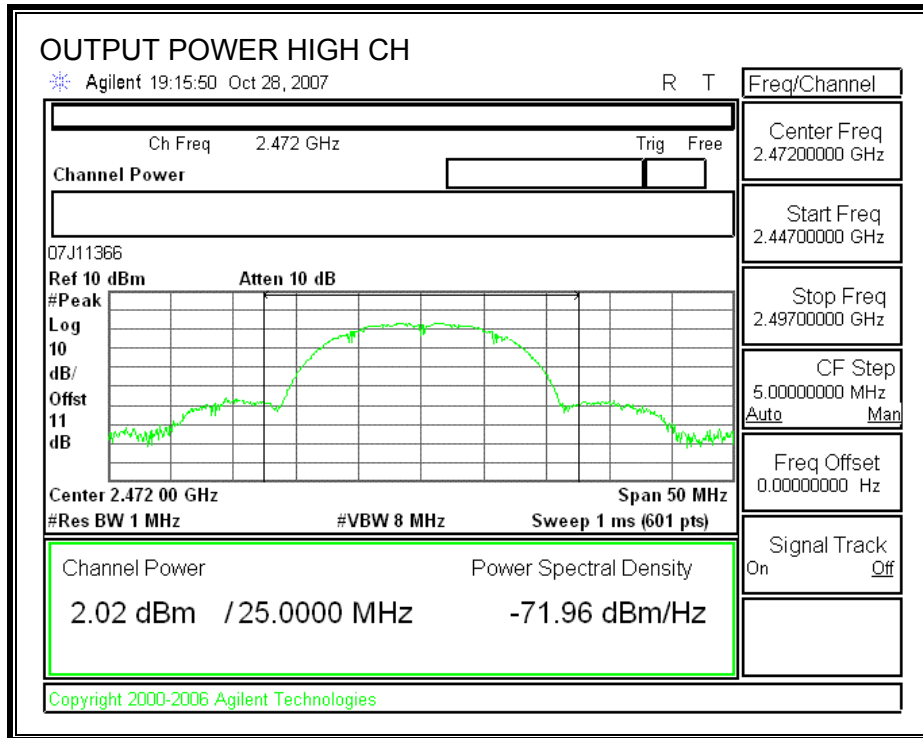
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	2.46	30	-27.54
Middle	2442	2.46	30	-27.54
High	2472	2.02	30	-27.98

**OUTPUT POWER**





### 7.1.4. AVERAGE POWER

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	0.10
Middle	2442	0.30
High	2472	0.10

### 7.1.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

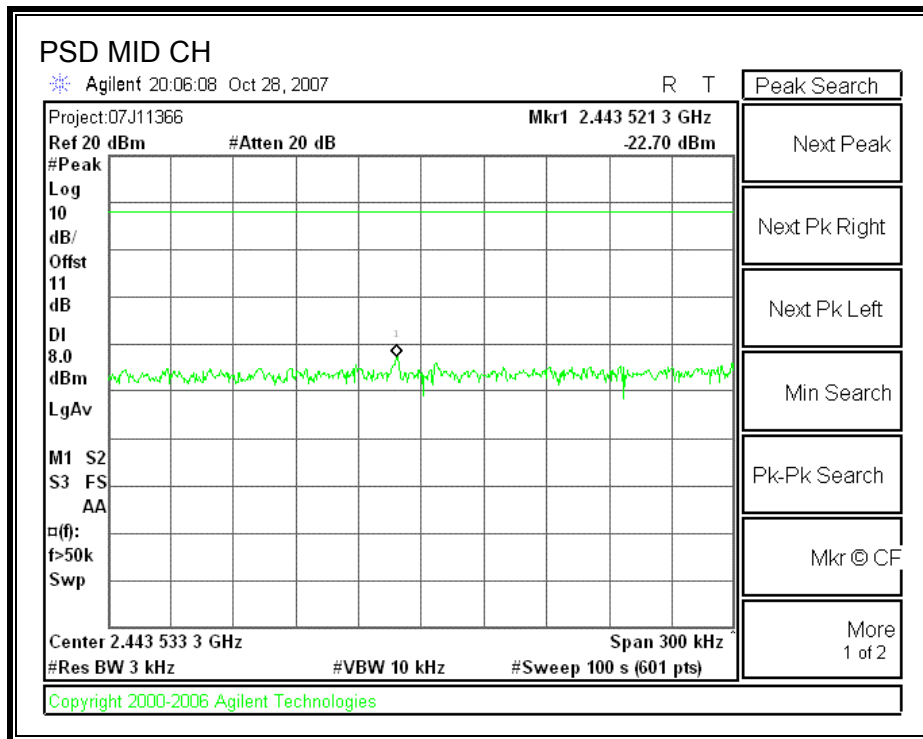
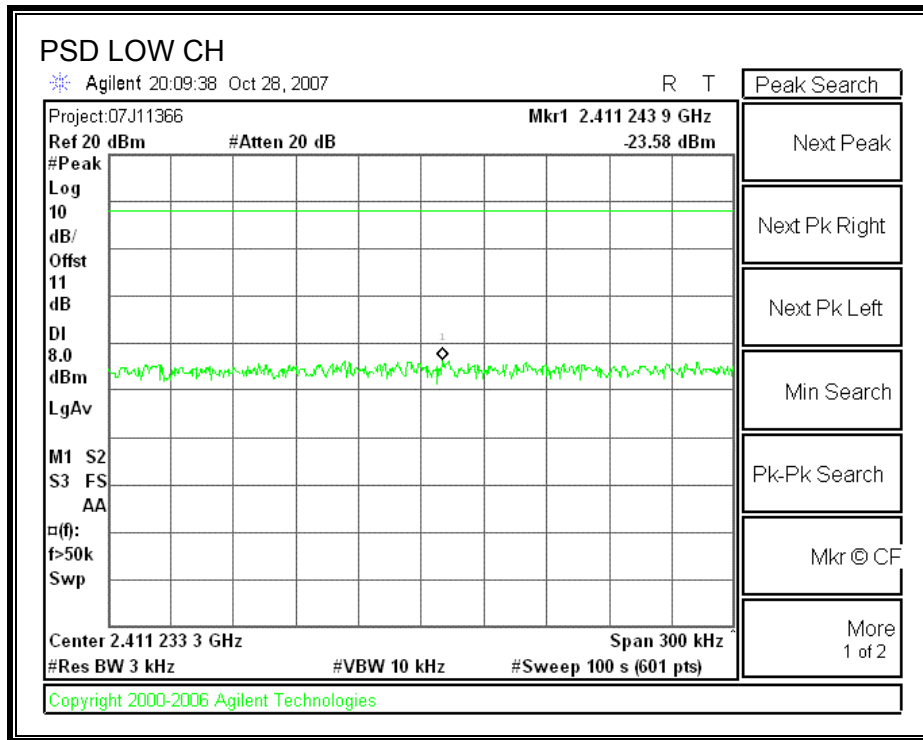
#### TEST PROCEDURE

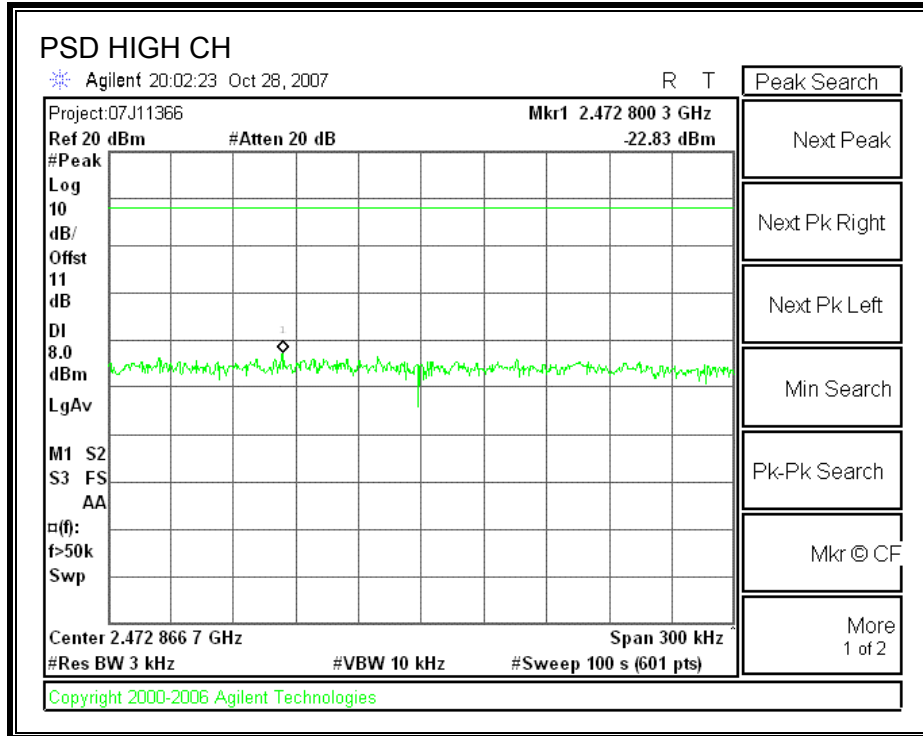
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

#### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-23.58	8	-31.58
Middle	2442	-22.70	8	-30.70
High	2472	-22.83	8	-30.83

**POWER SPECTRAL DENSITY**





## **7.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **TEST PROCEDURE**

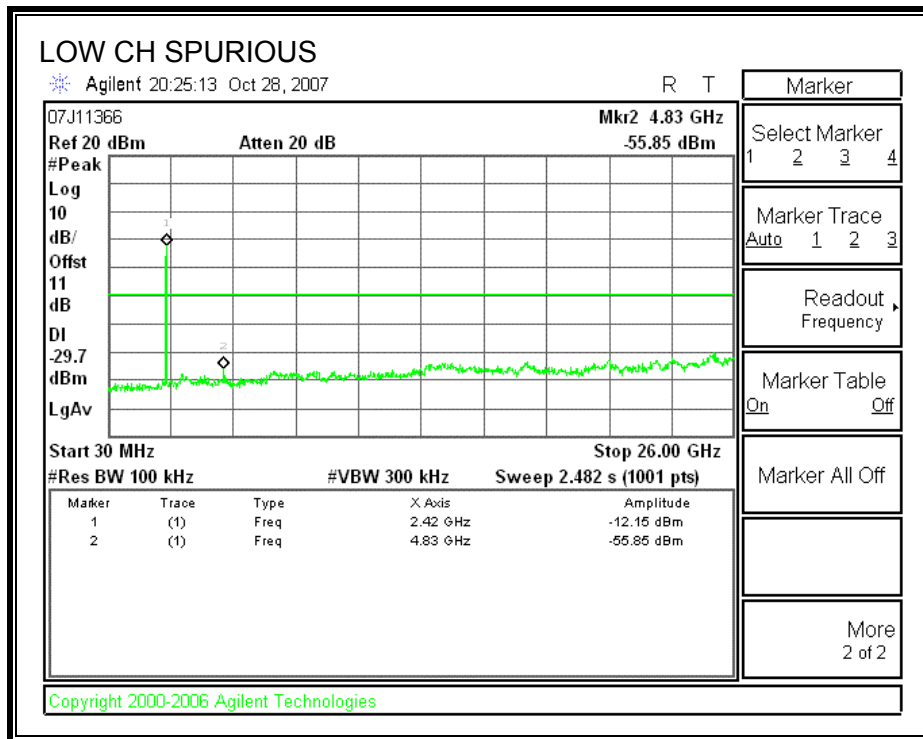
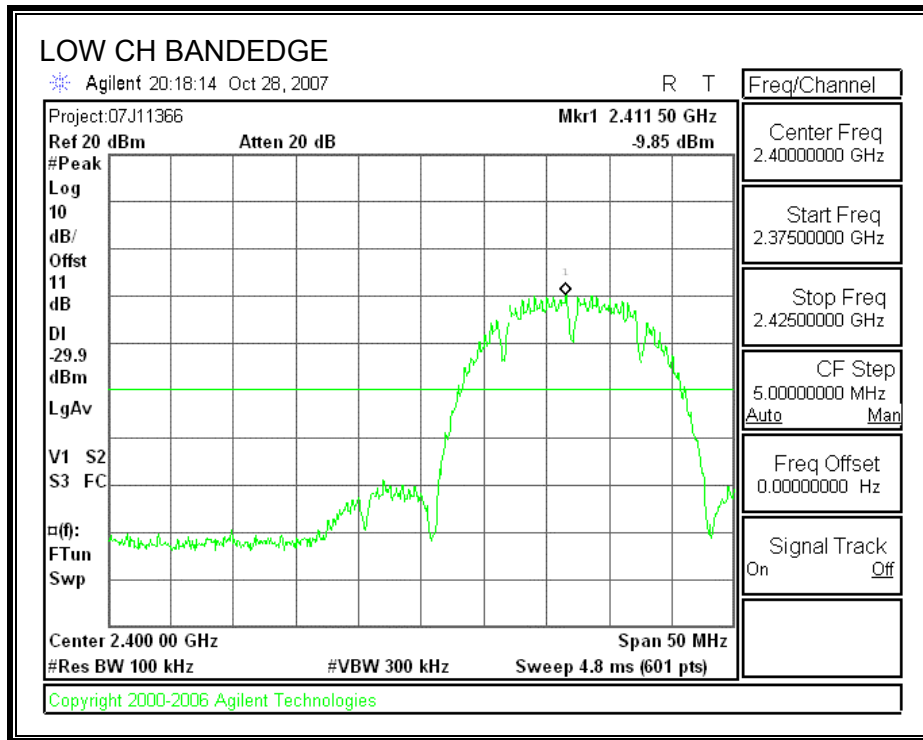
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

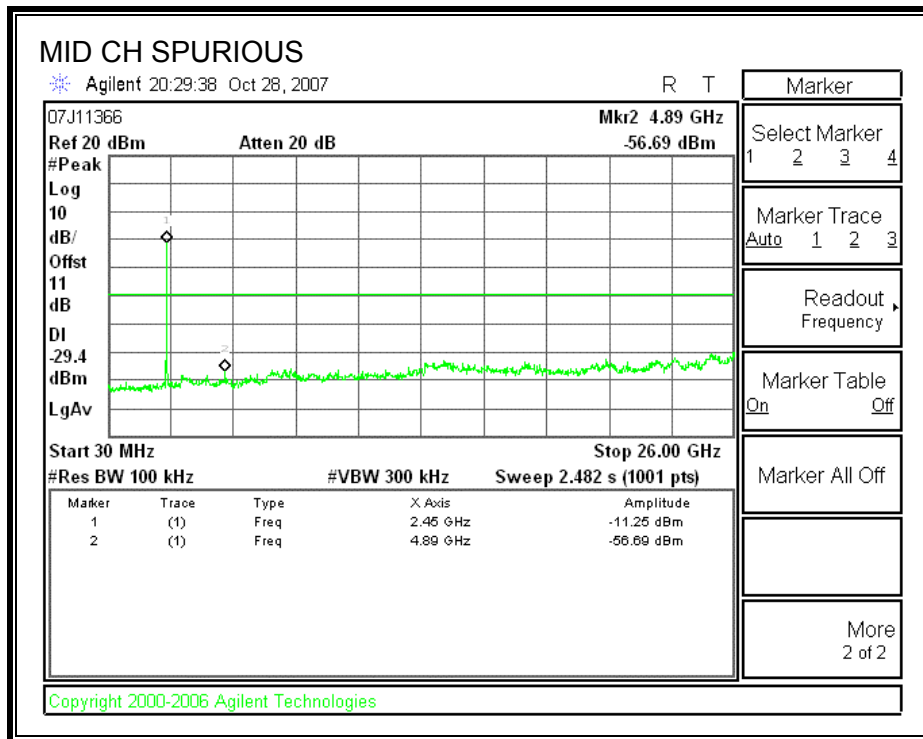
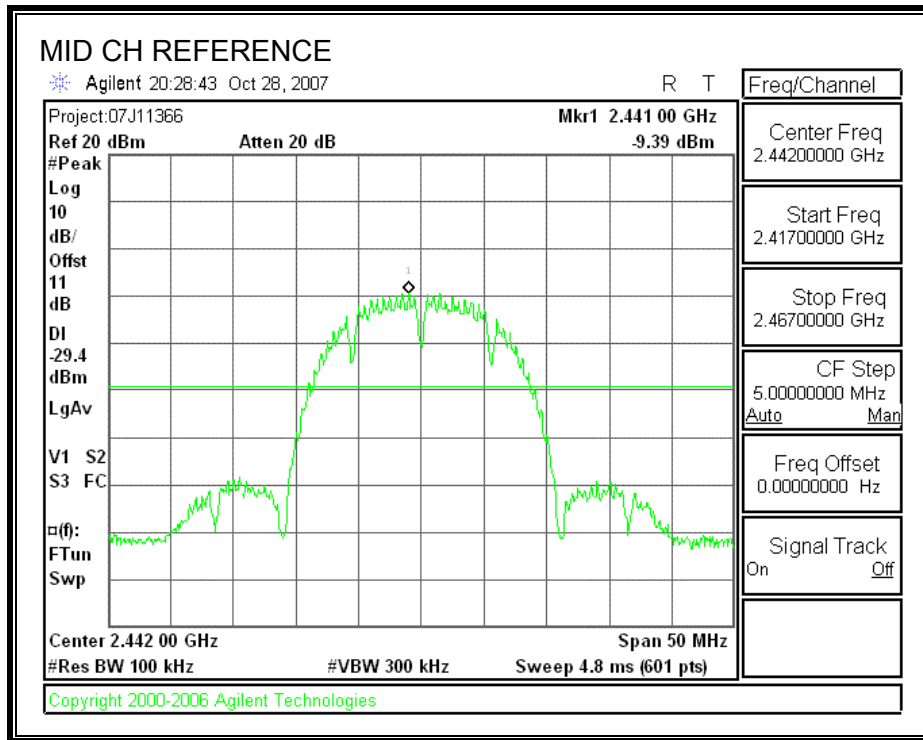
### **RESULTS**



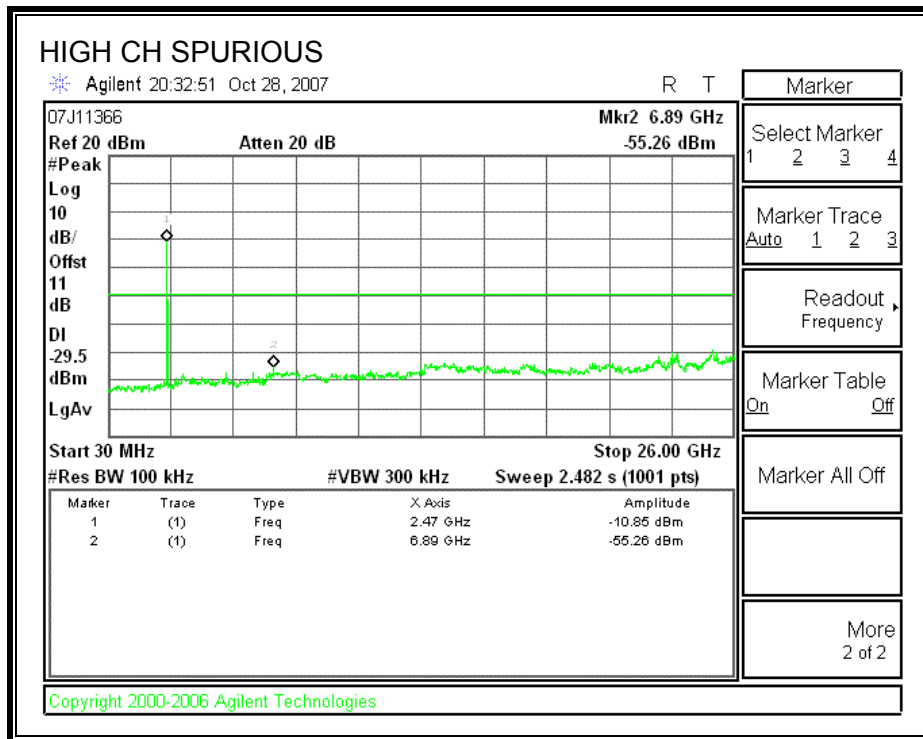
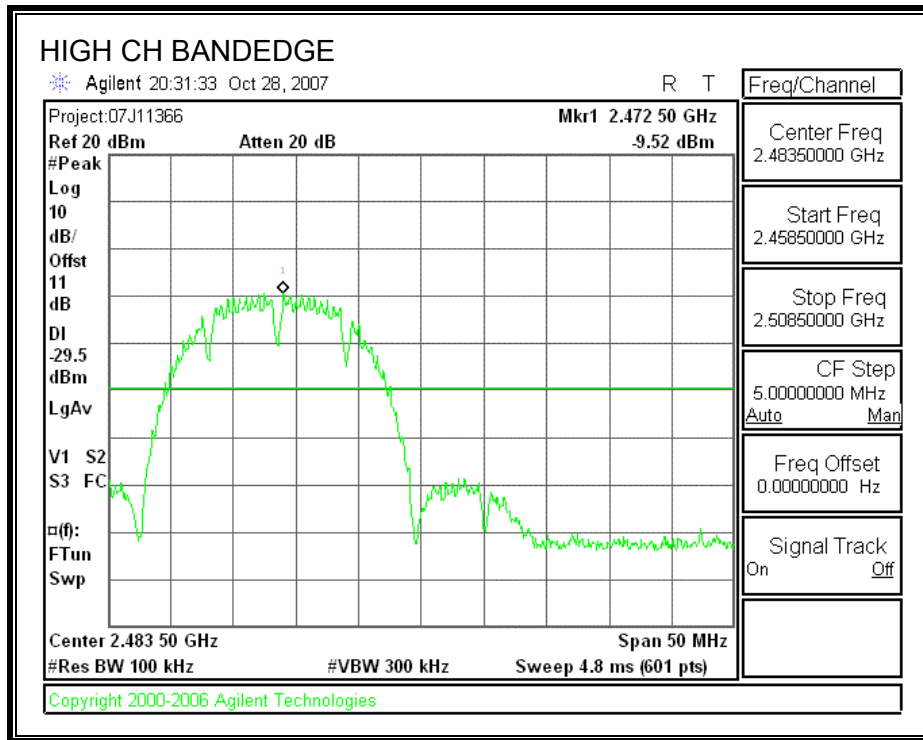
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



## 7.2. 802.11g MODE IN THE 2.4 GHz BAND

### 7.2.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

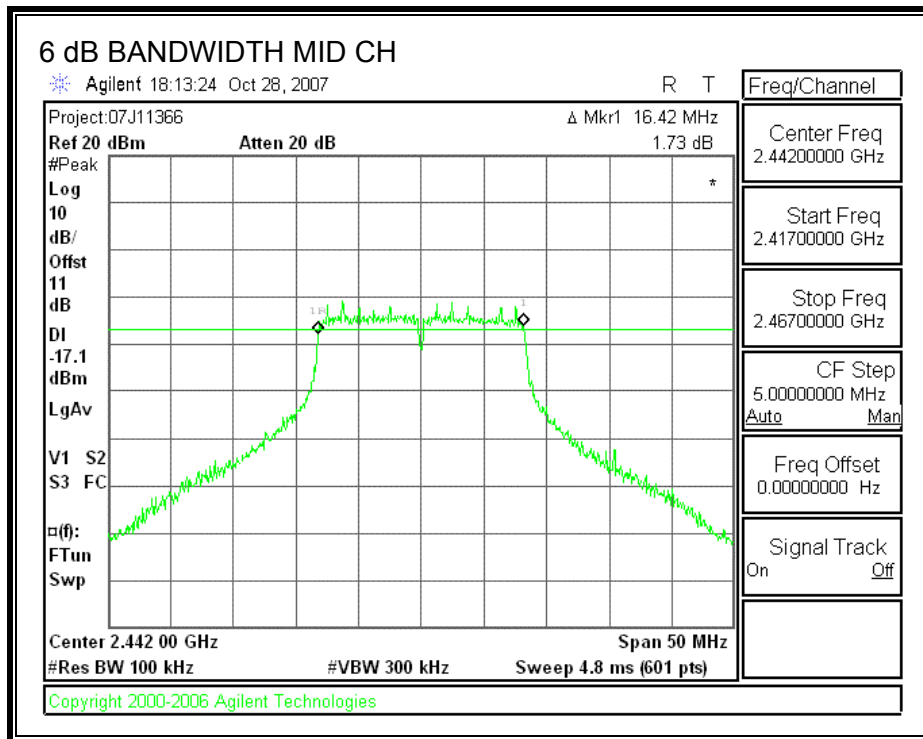
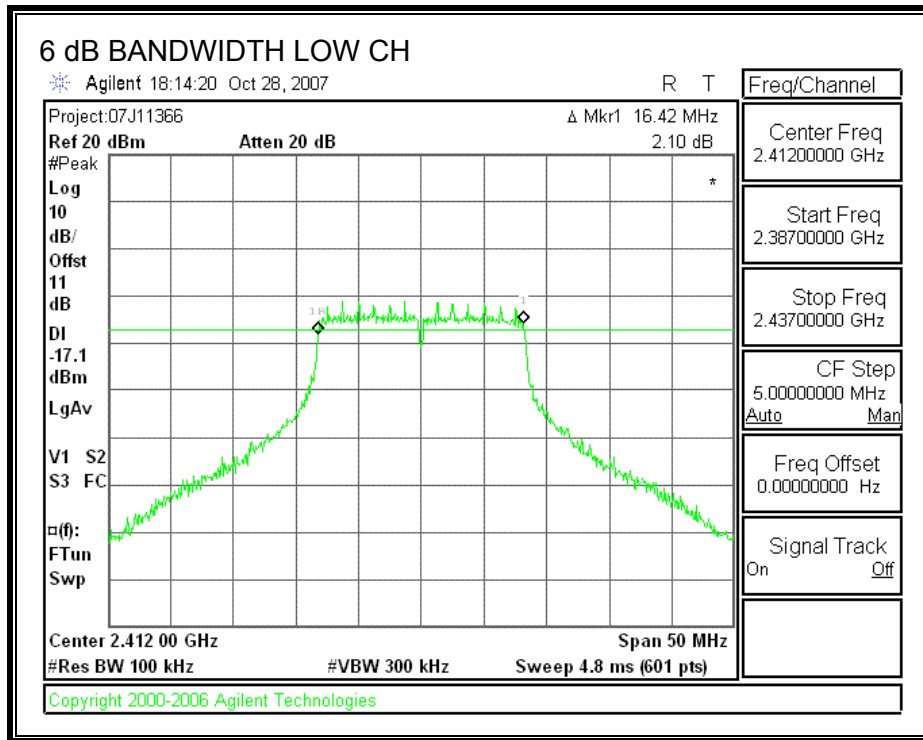
#### TEST PROCEDURE

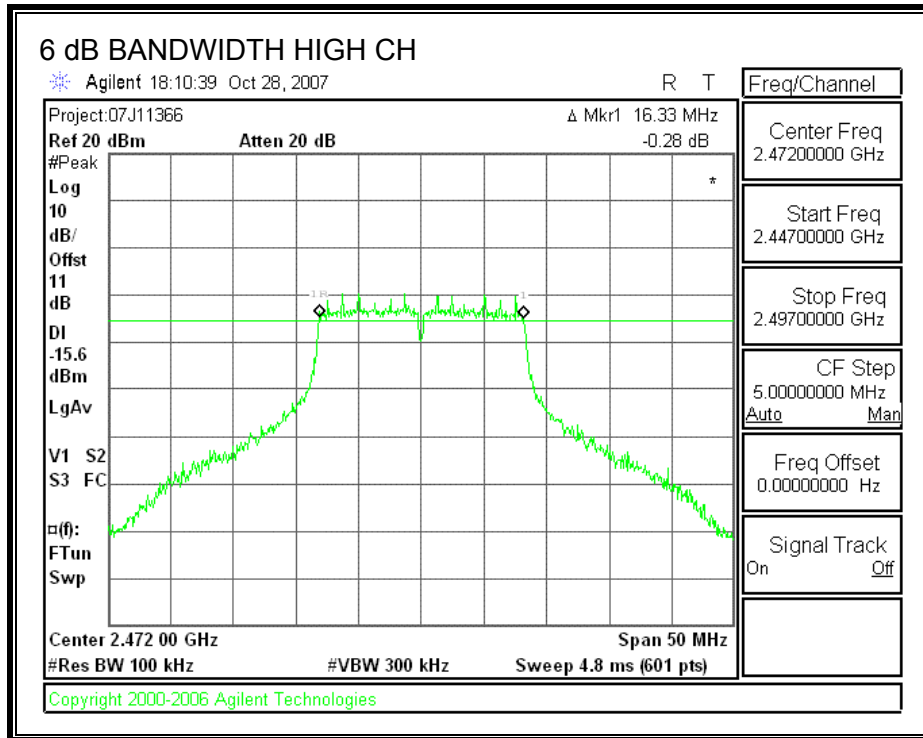
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.42	0.5
Middle	2442	16.42	0.5
High	2472	16.33	0.5

**6 dB BANDWIDTH**





## 7.2.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

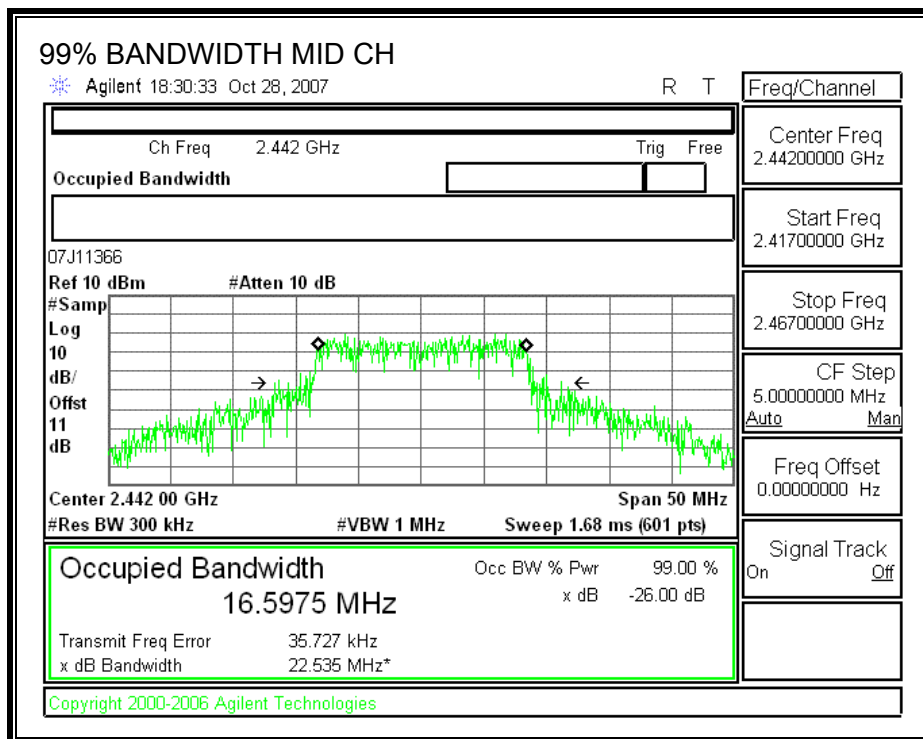
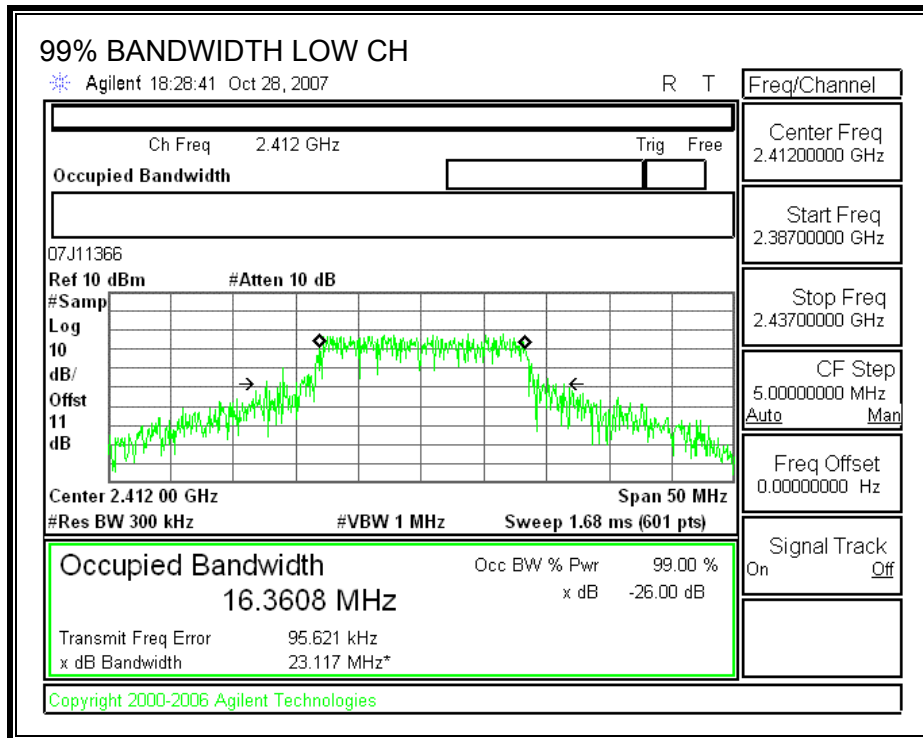
### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

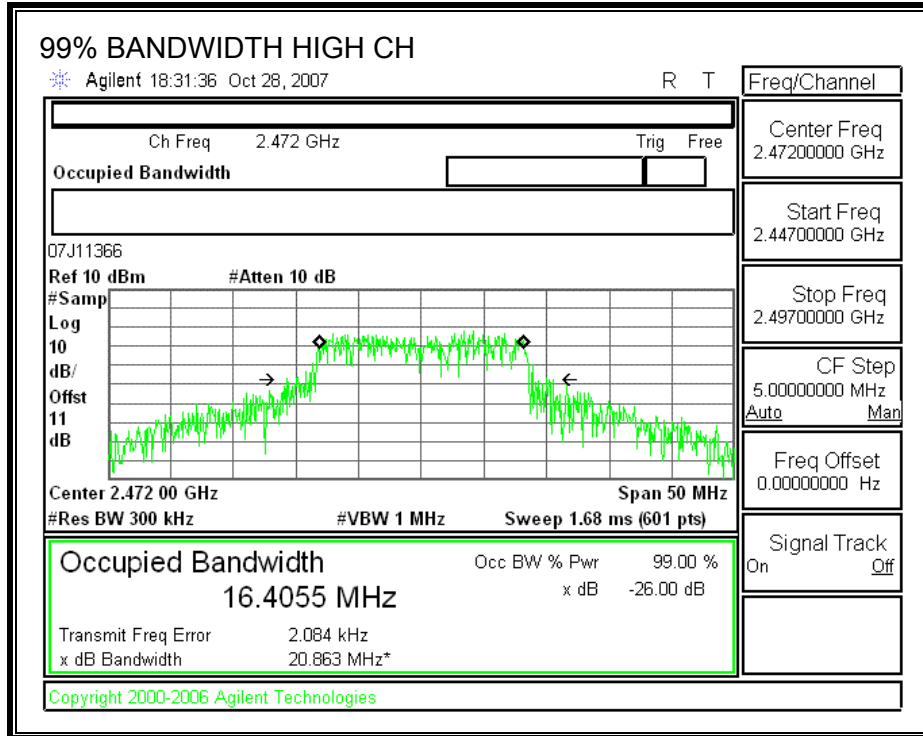
### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.3608
Middle	2442	16.5975
High	2472	16.4055

**99% BANDWIDTH**







### 7.2.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

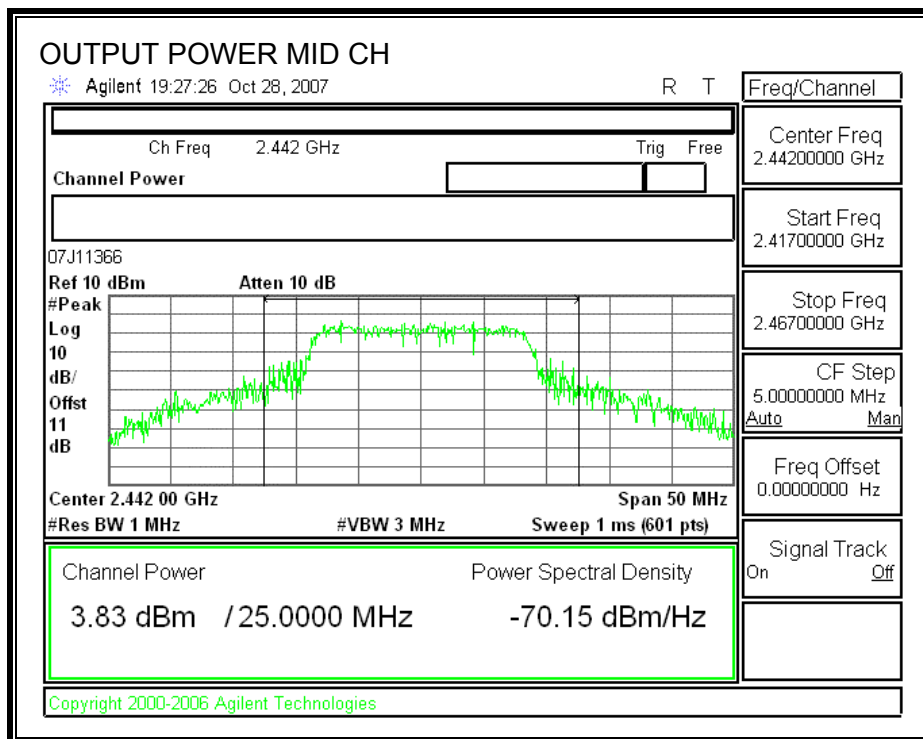
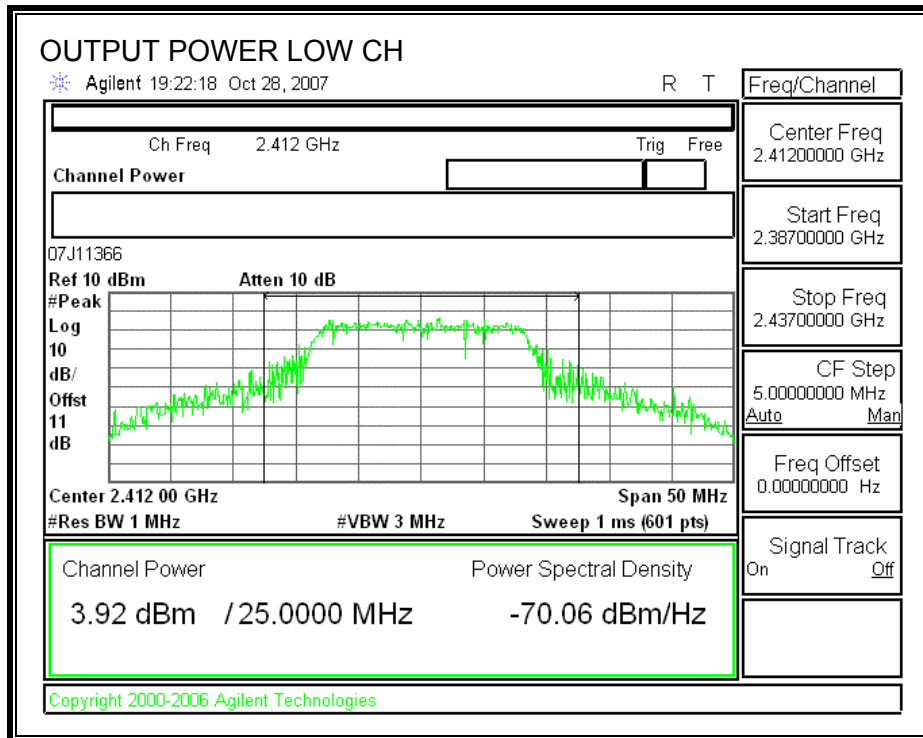
#### TEST PROCEDURE

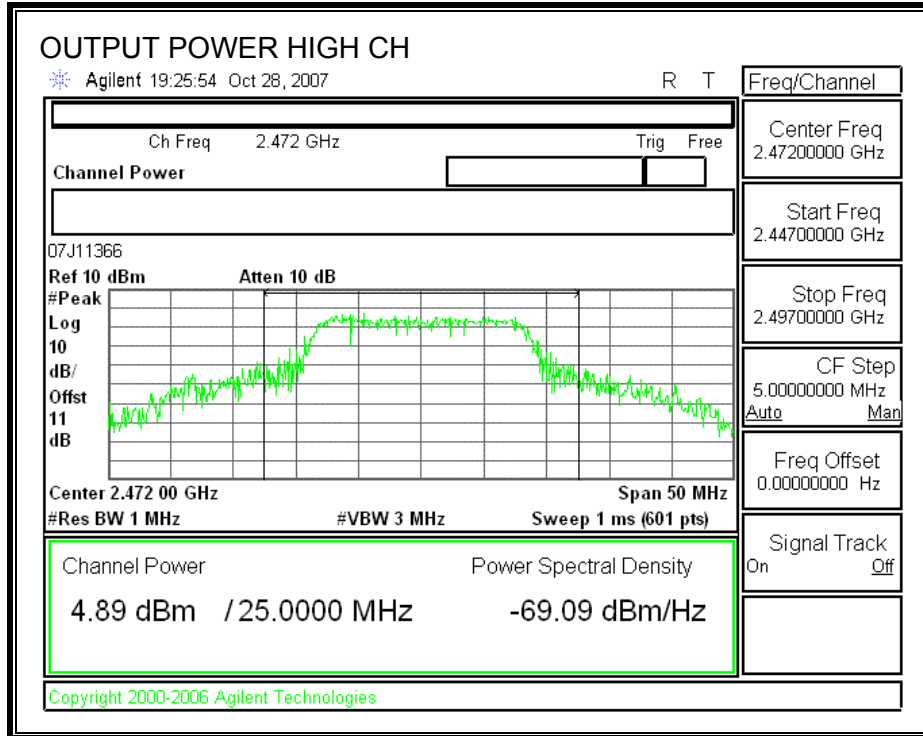
Peak power is measured using the spectrum analyzer's internal channel power integration function. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	3.92	30	-26.08
Middle	2442	3.83	30	-26.17
High	2472	4.89	30	-25.11

**OUTPUT POWER**





## 7.2.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	0.10
Middle	2442	0.20
High	2472	0.32

## 7.2.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

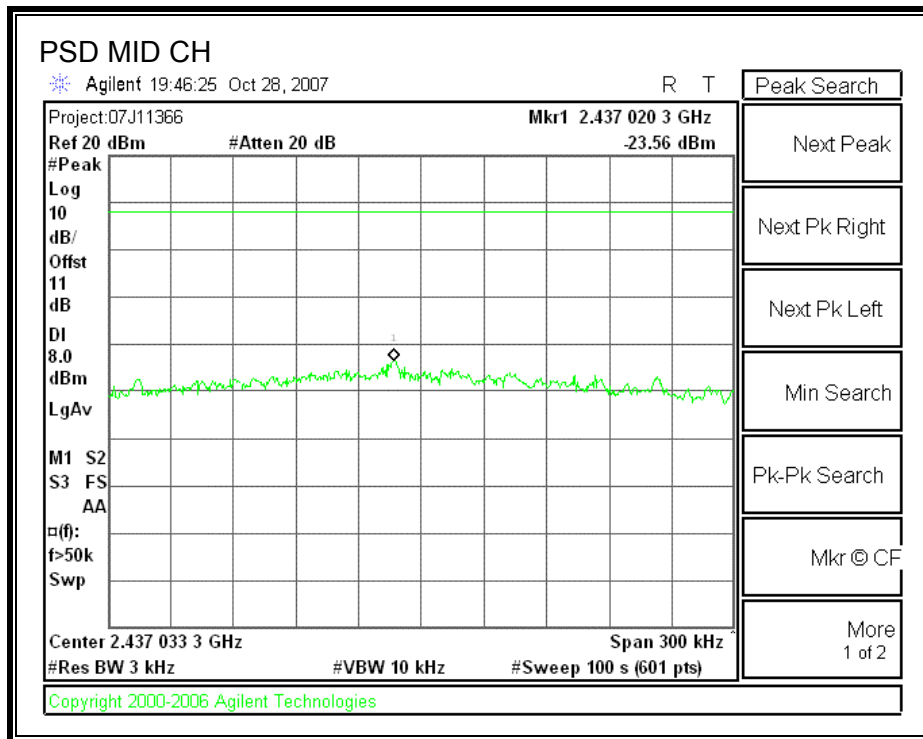
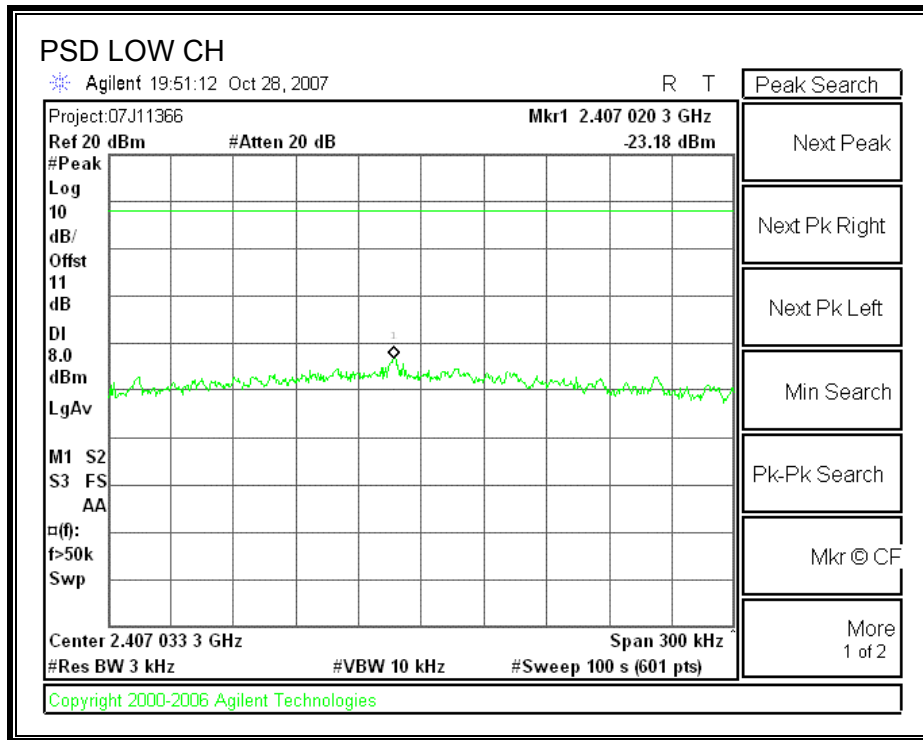
### TEST PROCEDURE

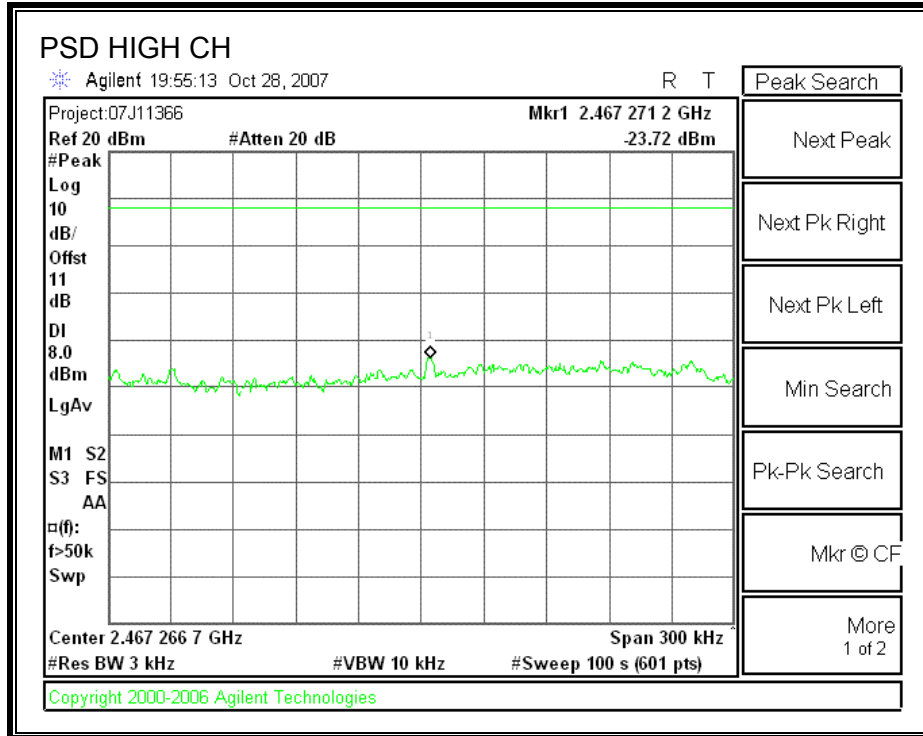
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

### RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-23.18	8	-31.18
Middle	2442	-23.56	8	-31.56
High	2472	-23.72	8	-31.72

**POWER SPECTRAL DENSITY**







## **7.2.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

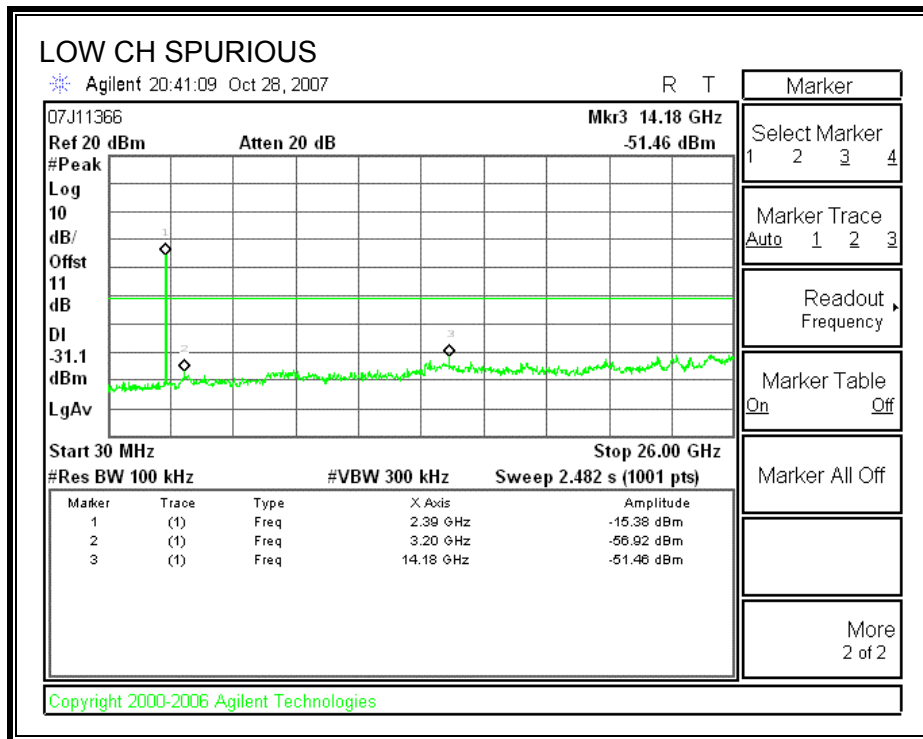
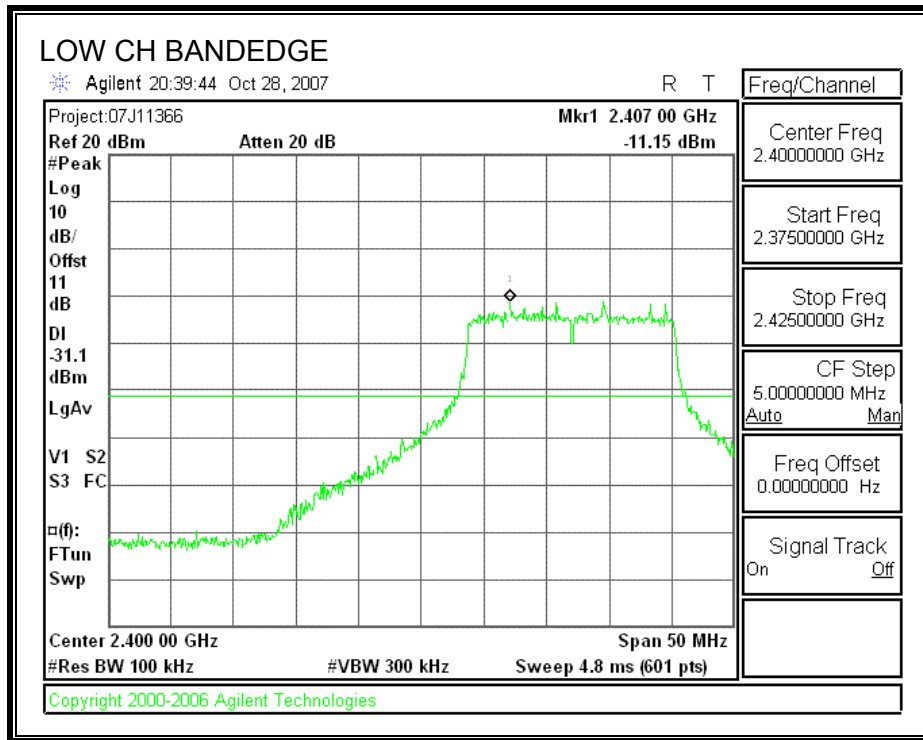
### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

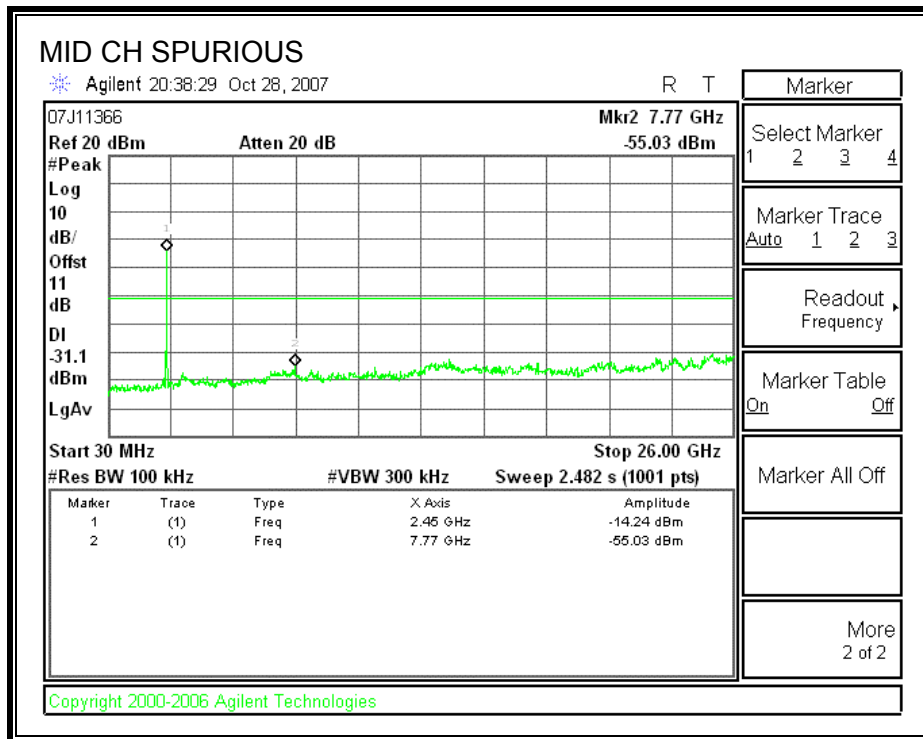
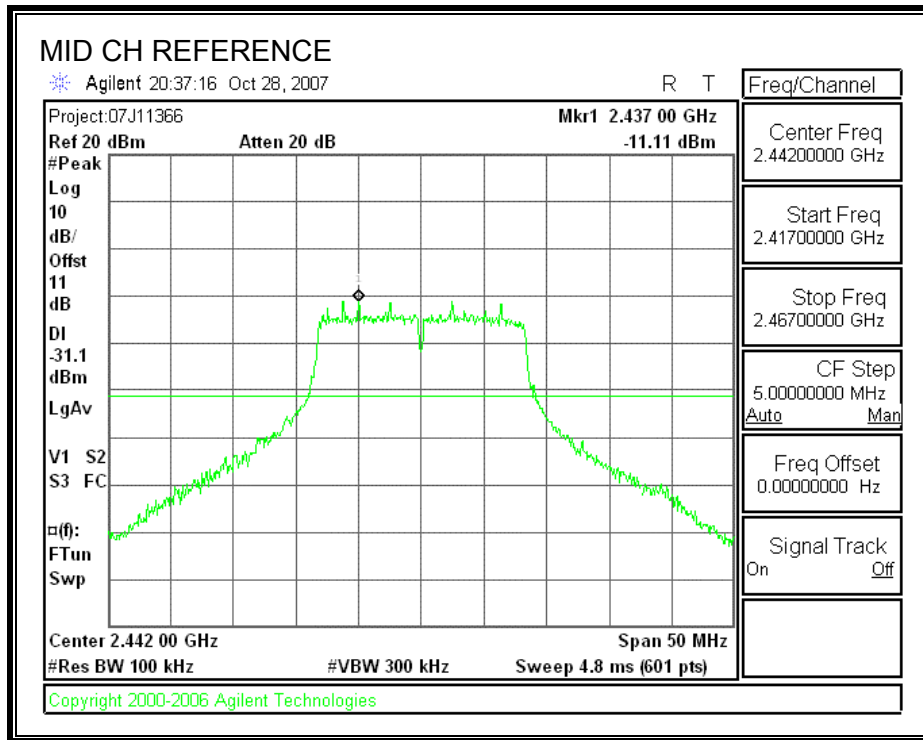
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### **RESULTS**

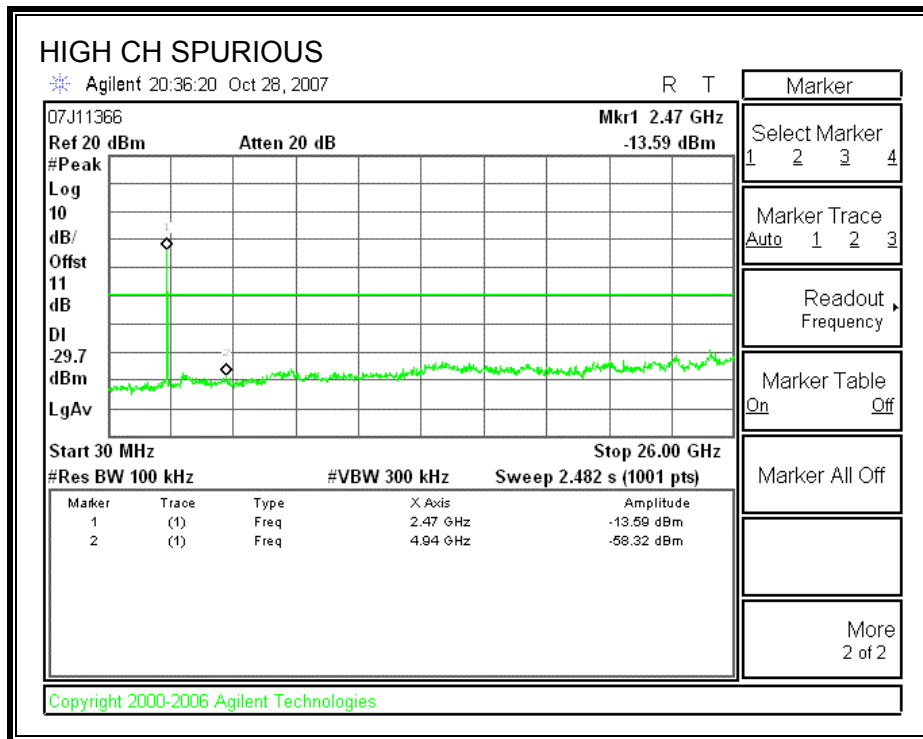
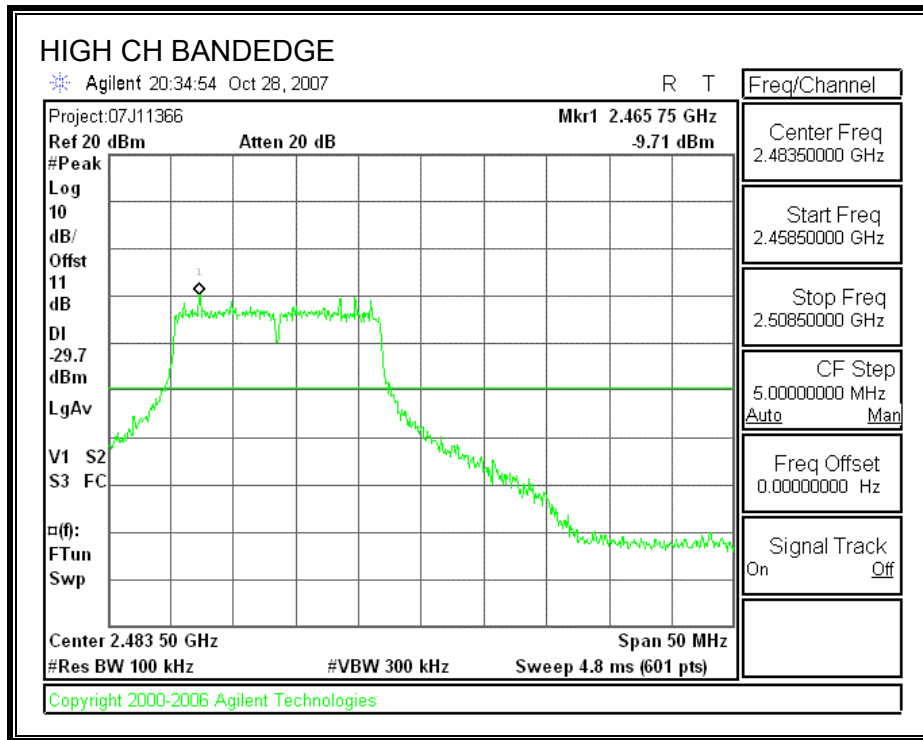
**SPURIOUS EMISSIONS, LOW CHANNEL**



**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

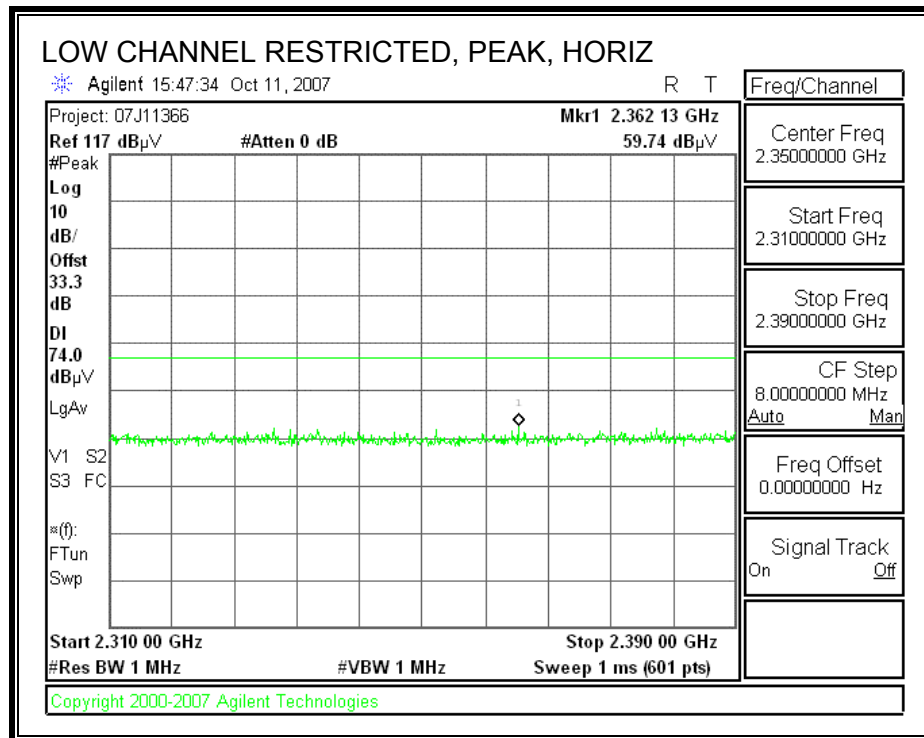
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

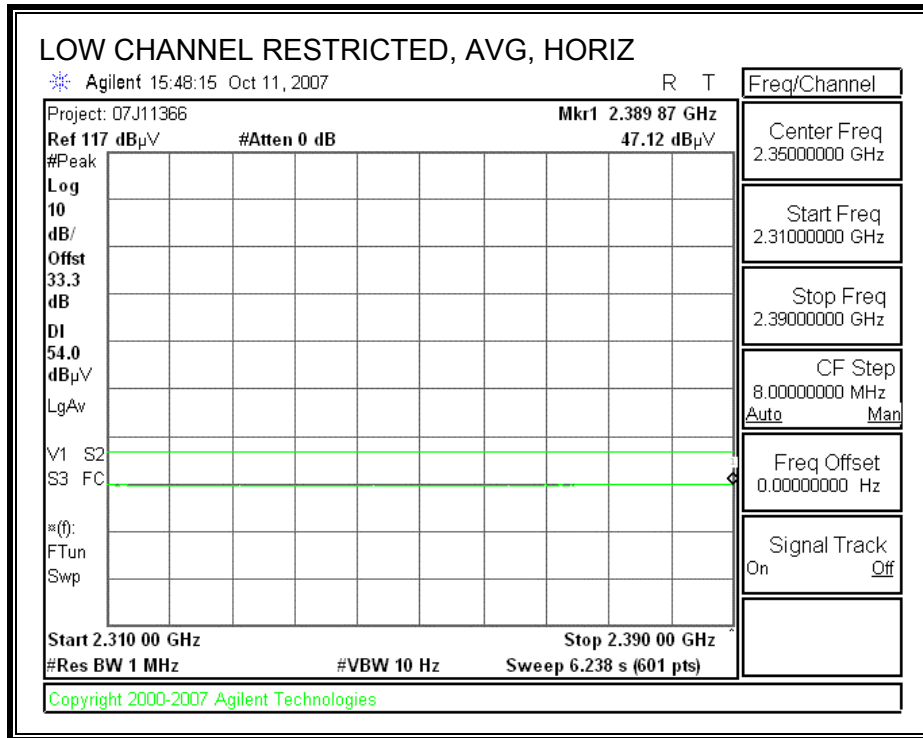
## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

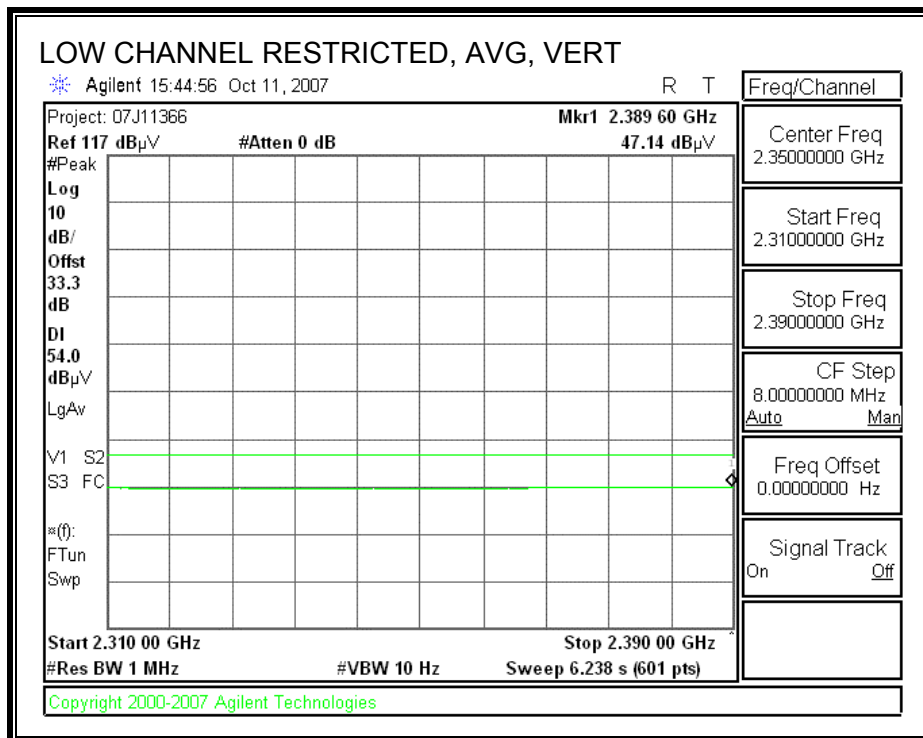
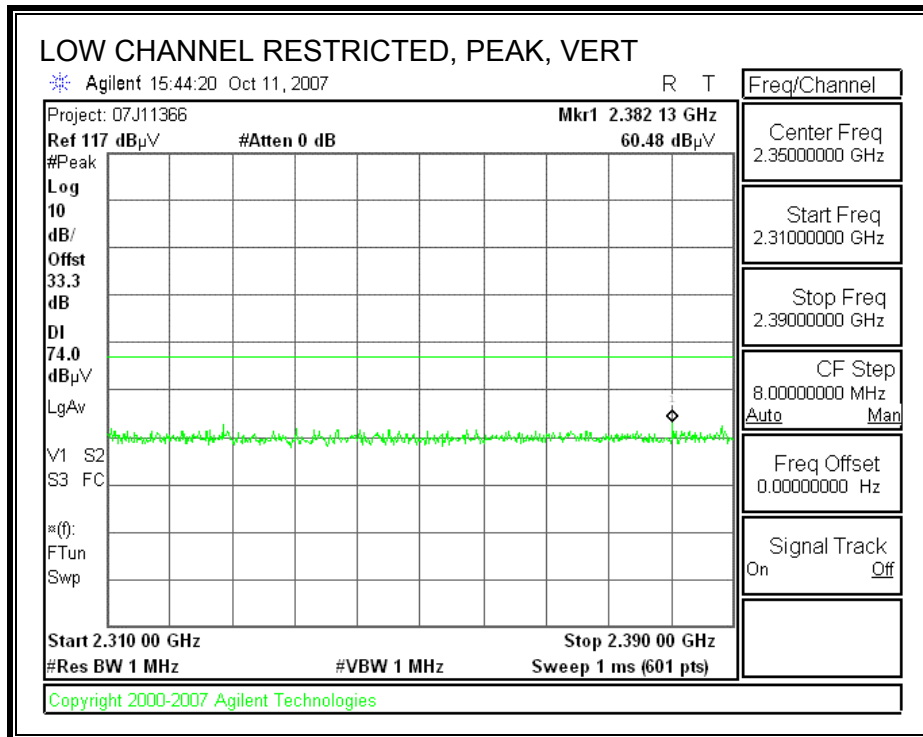
MONOPOLE 2.76 dBi ANTENNA

#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



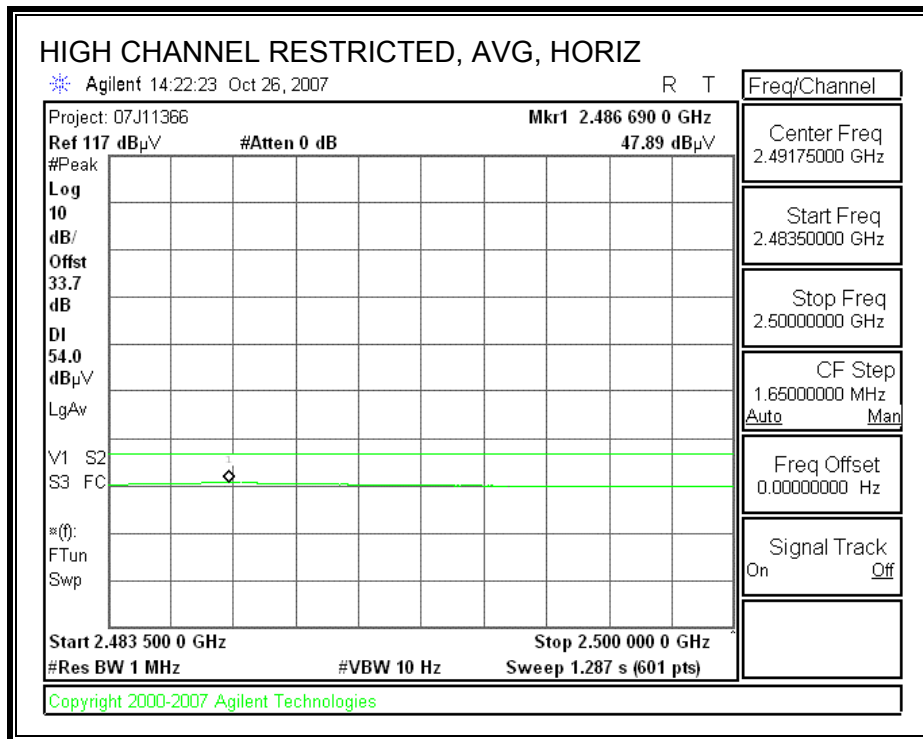
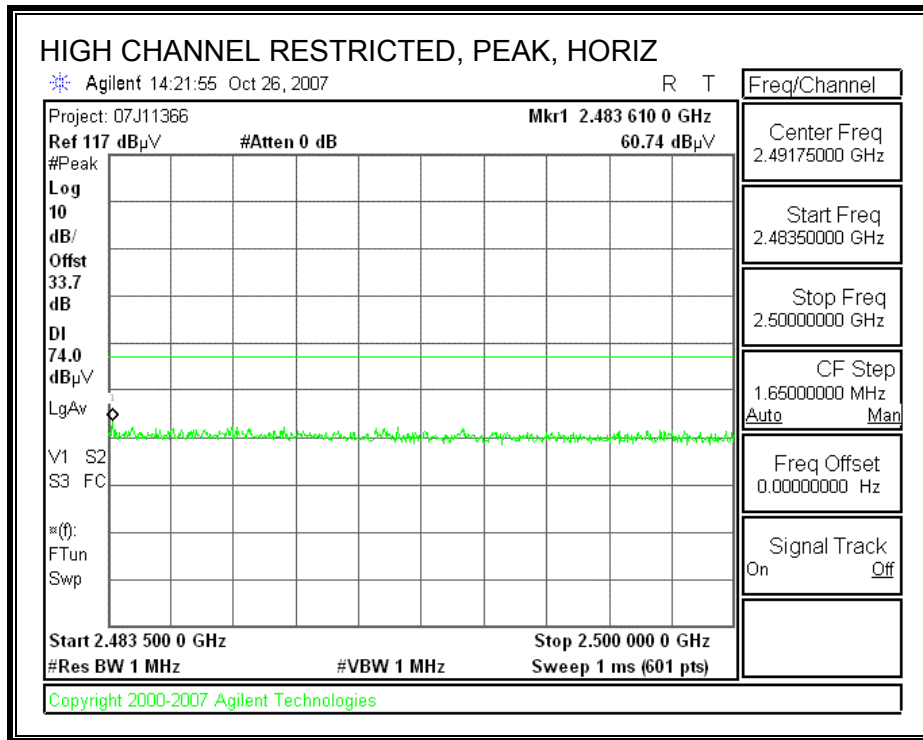


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

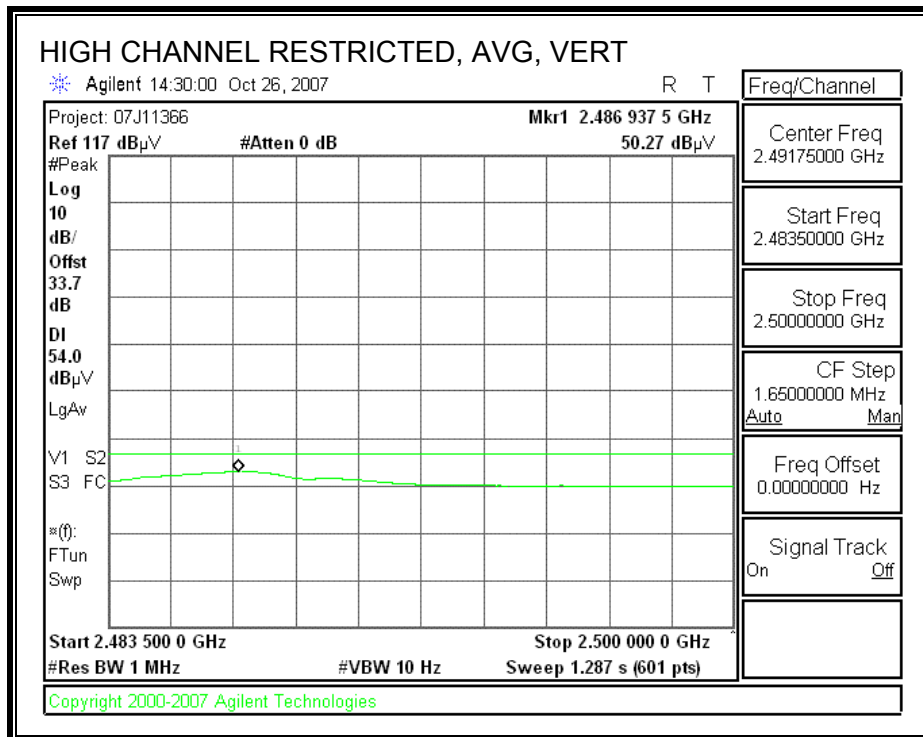
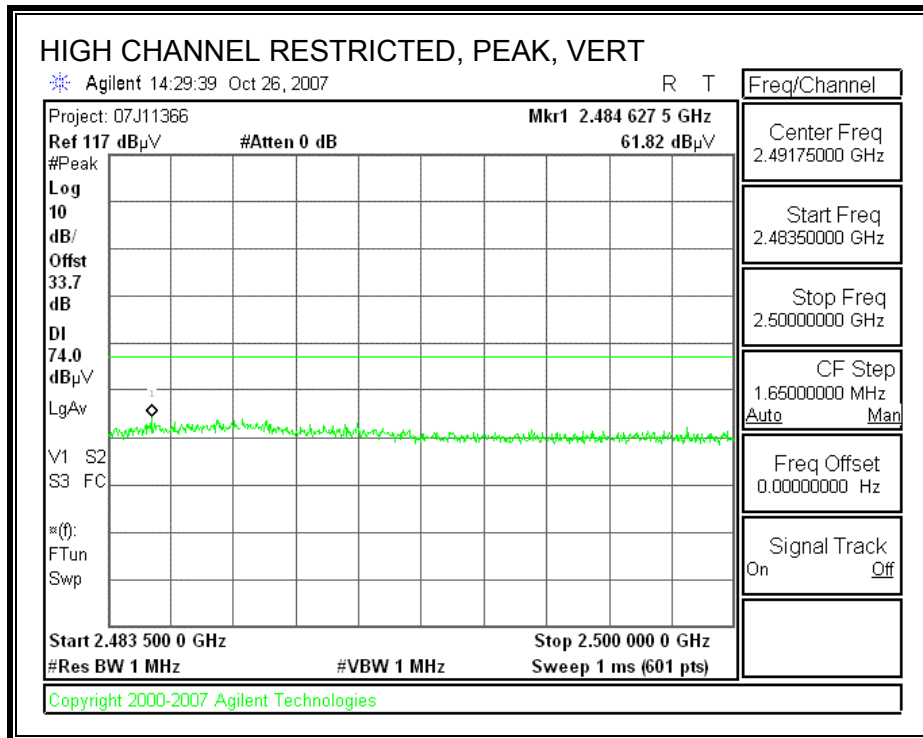




**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

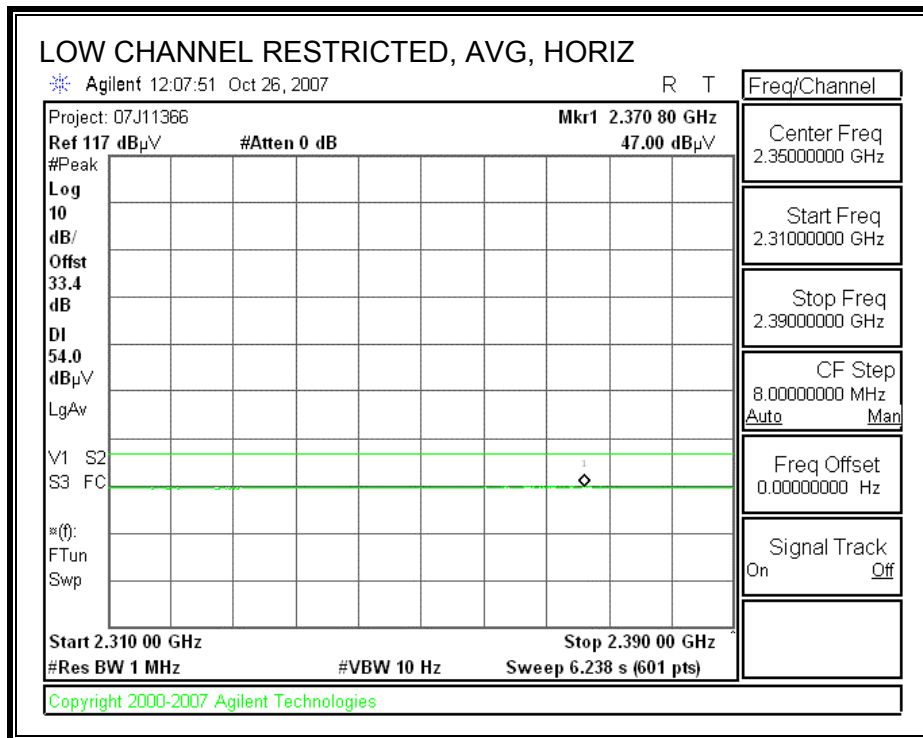
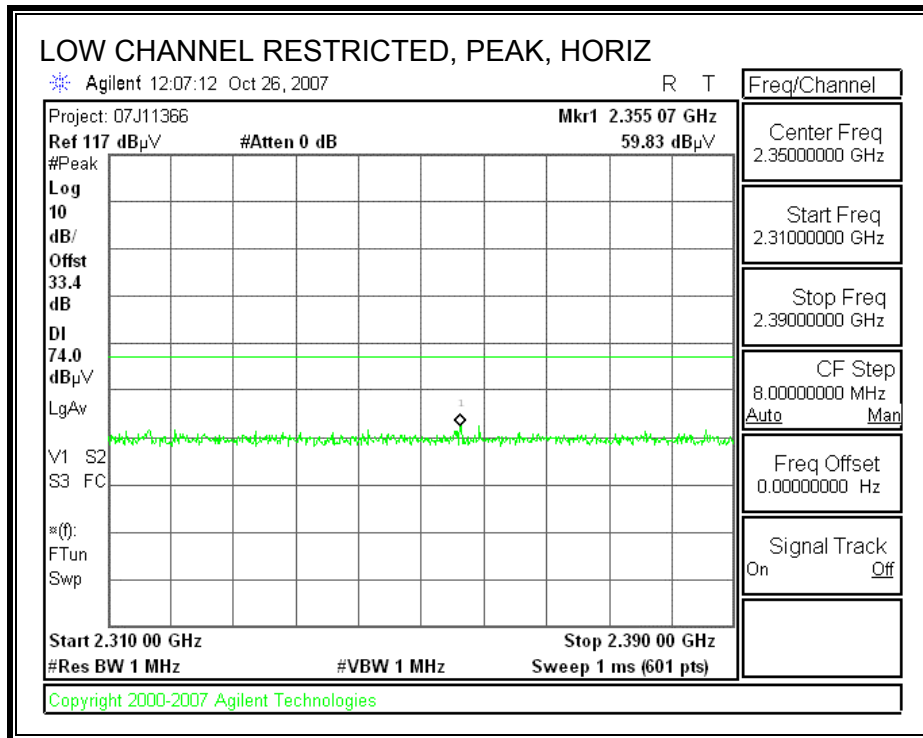


**HARMONICS AND SPURIOUS EMISSIONS**

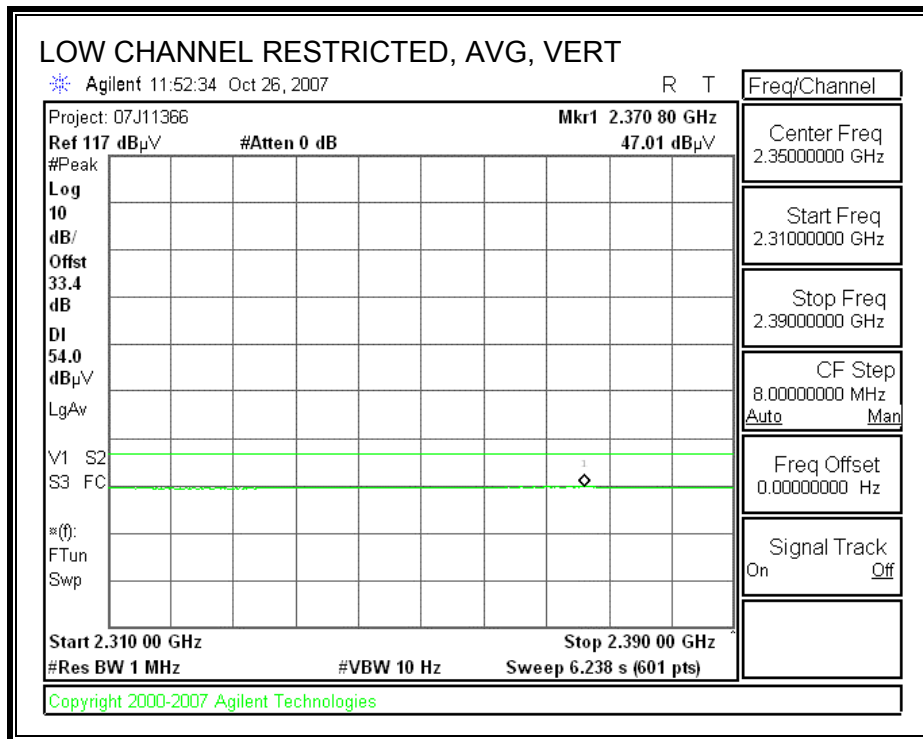
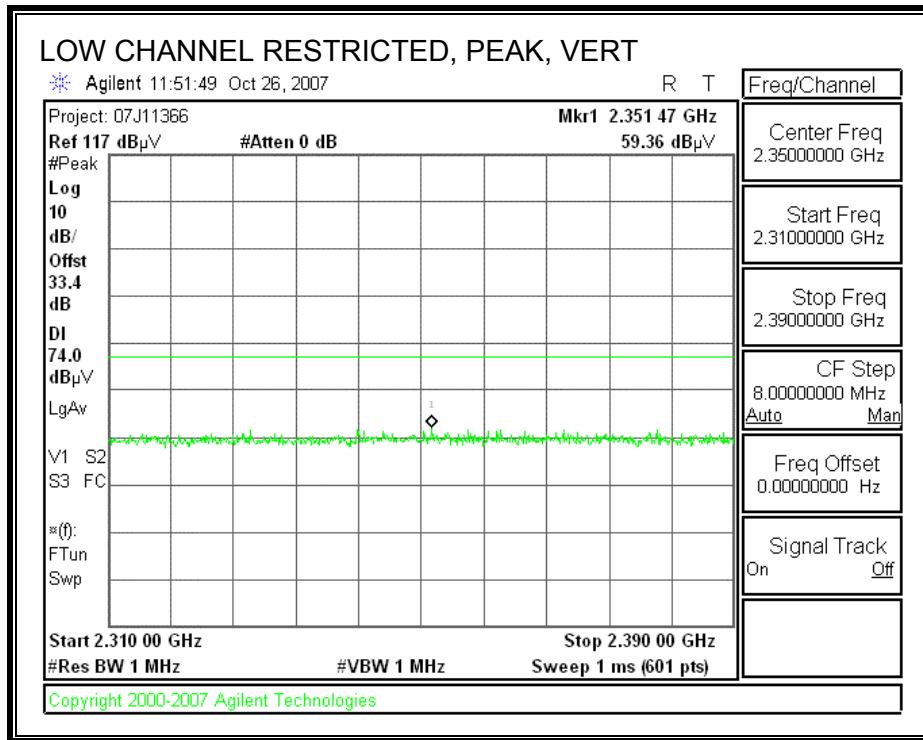
<b>High Frequency Measurement</b> Compliance Certification Services																	
Company: Maruta Manufacturing Company, Ltd Project #: 07J11366 Date: 10/11/07 Test Engineer: Vien Tran Configuration: EUT with Monopole 2.76 dBi Antenna Mode: Tx 11b Mode																	
<b>Test Equipment:</b>																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T120; S/N: 29310 @3m			T34 HP 8449B									FCC 15.205					
Hi Frequency Cables																	
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter						
			Gordon 177080004			Chin 200354001			HPF_4.0GHz				Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz				
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
<b>LOW CHANNEL, 2412 MHz</b>																	
4.824	3.0	49.7	45.6	33.7	3.5	-34.8	0.0	0.6	52.6	48.5	74	54	-21.4	-5.5	Y		
4.824	3.0	46.4	42.4	33.7	3.5	-34.8	0.0	0.6	49.3	45.3	74	54	-24.7	-8.7	H		
<b>MID CHANNEL, 2442 MHz</b>																	
4.884	3.0	50.1	46.0	33.8	3.5	-34.8	0.0	0.6	53.1	49.0	74	54	-20.9	-5.0	Y		
7.326	3.0	46.4	33.1	35.2	4.1	-34.1	0.0	0.6	52.2	38.9	74	54	-21.8	-15.1	Y		
4.884	3.0	46.5	38.1	33.8	3.5	-34.8	0.0	0.6	49.5	41.2	74	54	-24.5	-12.8	H		
7.326	3.0	46.3	33.1	35.2	4.1	-34.1	0.0	0.6	52.1	38.9	74	54	-21.9	-15.1	H		
<b>HI CHANNEL, 2472 MHz</b>																	
4.944	3.0	52.8	48.6	33.8	3.5	-34.8	0.0	0.6	55.9	51.7	74	54	-18.1	-2.3	Y		
7.416	3.0	44.1	32.2	35.2	4.1	-34.1	0.0	0.6	50.0	38.1	74	54	-24.0	-15.9	Y		
4.944	3.0	49.6	44.6	33.8	3.5	-34.8	0.0	0.6	52.7	47.7	74	54	-21.3	-6.3	H		
7.416	3.0	43.2	31.8	35.2	4.1	-34.1	0.0	0.6	49.1	37.7	74	54	-24.9	-16.3	H		
No other emissions were detected above system noise floor																	
f	Measurement Frequency					Amp	Preamp Gain					Avg Lim	Average Field Strength Limit				
Dist	Distance to Antenna					D Corr	Distance Correct to 3 meters					Pk Lim	Peak Field Strength Limit				
Read	Analyzer Reading					Avg	Average Field Strength @ 3 m					Avg Mar	Margin vs. Average Limit				
AF	Antenna Factor					Peak	Calculated Peak Field Strength					Pk Mar	Margin vs. Peak Limit				
CL	Cable Loss					HPF	High Pass Filter										

SLEEVE -0.73 dBi ANTENNA

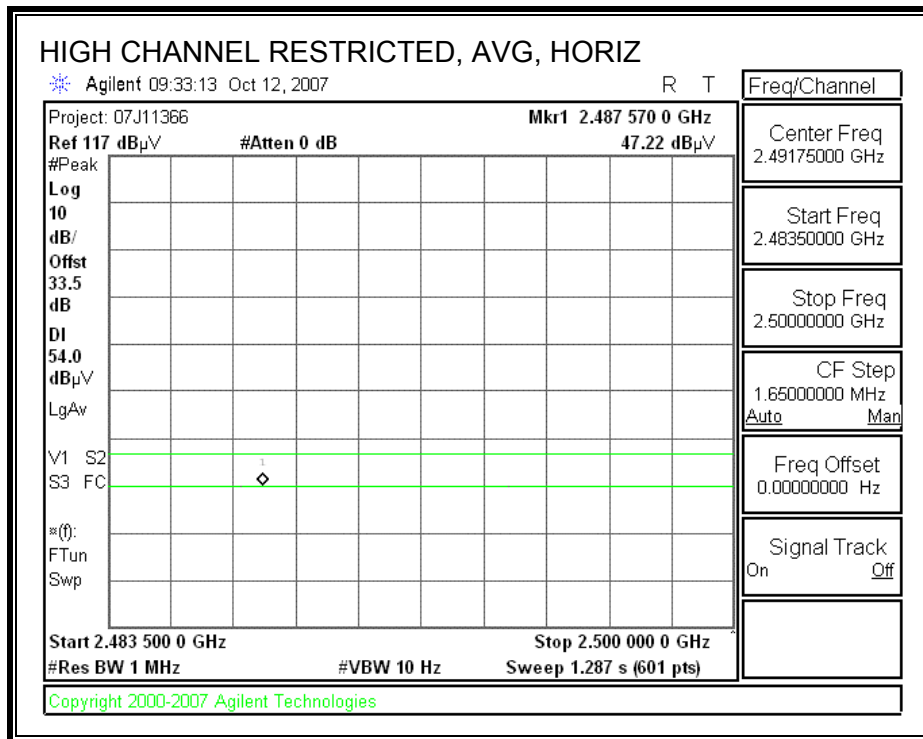
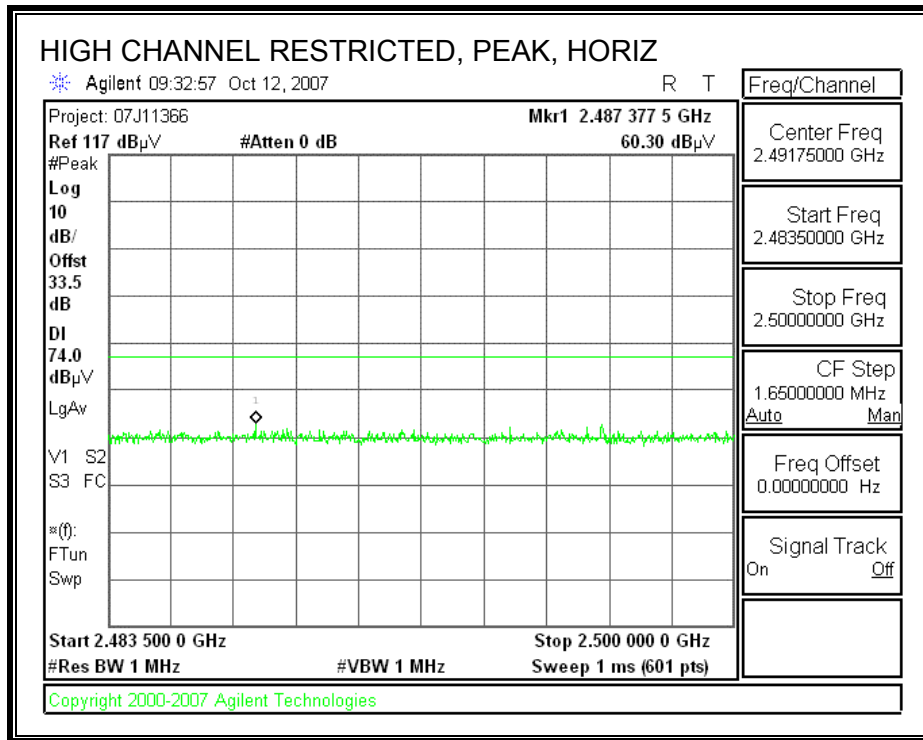
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



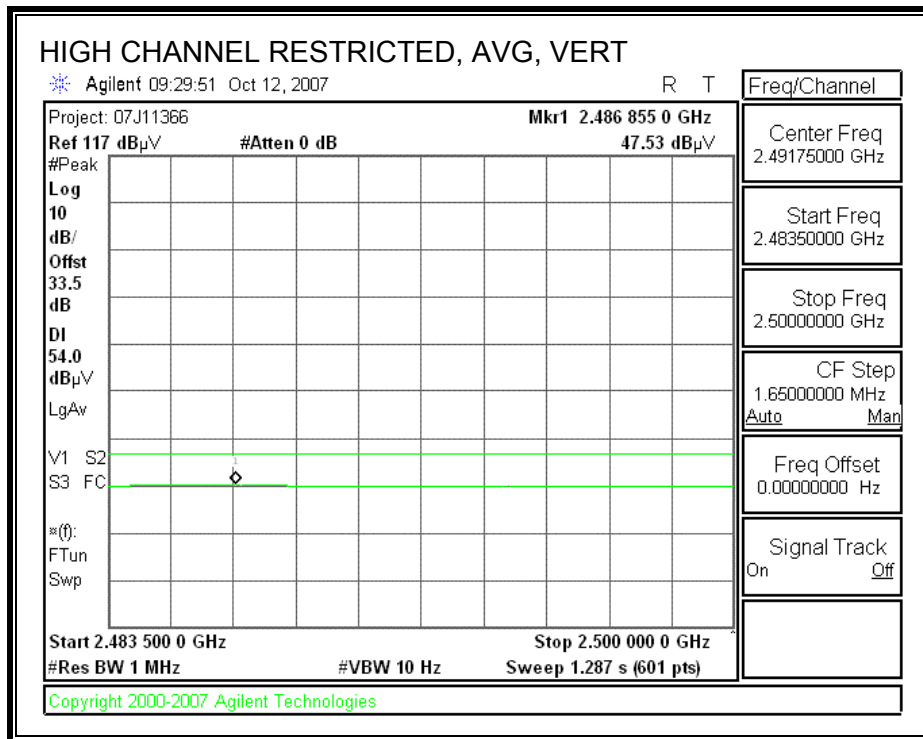
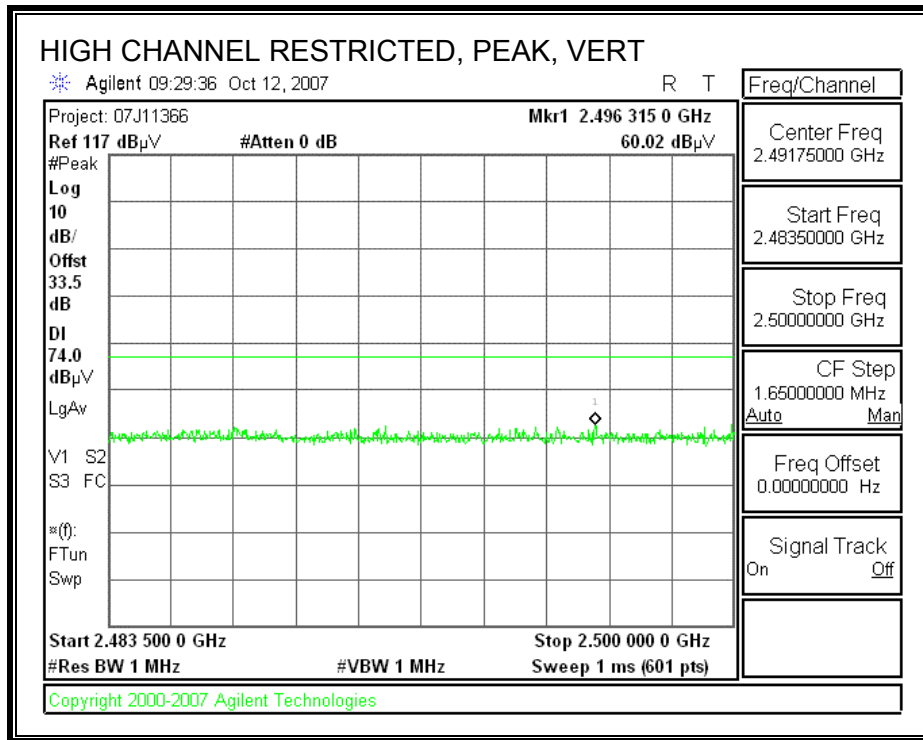
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Maruta Manufacturing Company, Ltd  
 Project #: 07J11366  
 Date: 10/26/2007  
 Test Engineer: Mengistu Mekuria  
 Configuration: EUT with Sleeve -0.73dBi Antenna  
 Mode: Tx 11b Mode

**Test Equipment:**

<b>Horn 1-18GHz</b>	<b>Pre-amplifier 1-26GHz</b>	<b>Pre-amplifier 26-40GHz</b>	<b>Horn &gt; 18GHz</b>	<b>Limit</b>
T60; S/N: 2238 @3m	T145 Agilent 3008A0050			FCC 15.209

Hi Frequency Cables

<b>2 foot cable</b>	<b>3 foot cable</b>	<b>12 foot cable</b>	<b>HPF</b>	<b>Reject Filter</b>	<b>Peak Measurements</b> RBW=VBW=1MHz
		B-5m Chamber	HPF_4.0GHz		<b>Average Measurements</b> RBW=1MHz; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>LOW CHANNEL, 2412 MHz</b>															
4.824	3.0	45.3	40.9	33.0	7.1	-34.8	0.0	0.6	51.1	46.8	74	54	-22.9	-7.2	V
7.236	3.0	42.2	29.5	35.4	8.6	-34.7	0.0	0.6	52.1	39.5	74	54	-21.9	-14.5	V
4.824	3.0	47.3	42.9	33.0	7.1	-34.8	0.0	0.6	53.2	48.8	74	54	-20.8	-5.2	H
7.236	3.0	42.6	29.5	35.4	8.6	-34.7	0.0	0.6	52.5	39.5	74	54	-21.5	-14.5	H
<b>MID CHANNEL, 2442 MHz</b>															
4.884	3.0	44.9	39.1	33.1	7.2	-34.9	0.0	0.6	50.9	45.1	74	54	-23.1	-8.9	V
7.326	3.0	42.4	29.3	35.5	8.7	-34.7	0.0	0.6	52.5	39.4	74	54	-21.5	-14.6	V
4.884	3.0	44.2	36.3	33.1	7.2	-34.9	0.0	0.6	50.2	42.3	74	54	-23.8	-11.7	H
7.326	3.0	42.4	29.3	35.5	8.7	-34.7	0.0	0.6	52.6	39.4	74	54	-21.4	-14.6	H
<b>HI CHANNEL, 2472 MHz</b>															
4.944	3.0	48.4	45.0	33.1	7.2	-34.9	0.0	0.6	54.5	51.0	74	54	-19.5	-3.0	V
7.416	3.0	42.7	29.0	35.6	8.7	-34.6	0.0	0.6	53.0	39.3	74	54	-21.0	-14.7	V
4.944	3.0	47.4	43.3	33.1	7.2	-34.9	0.0	0.6	53.5	49.4	74	54	-20.5	-4.6	H
7.416	3.0	41.8	29.1	35.6	8.7	-34.6	0.0	0.6	52.1	39.4	74	54	-21.9	-14.6	H

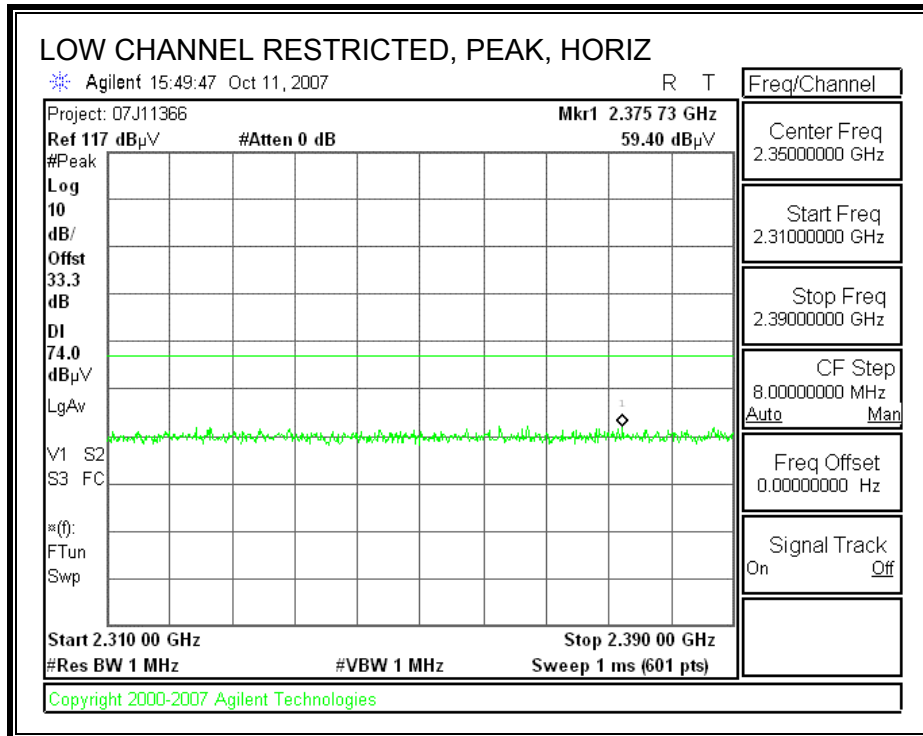
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

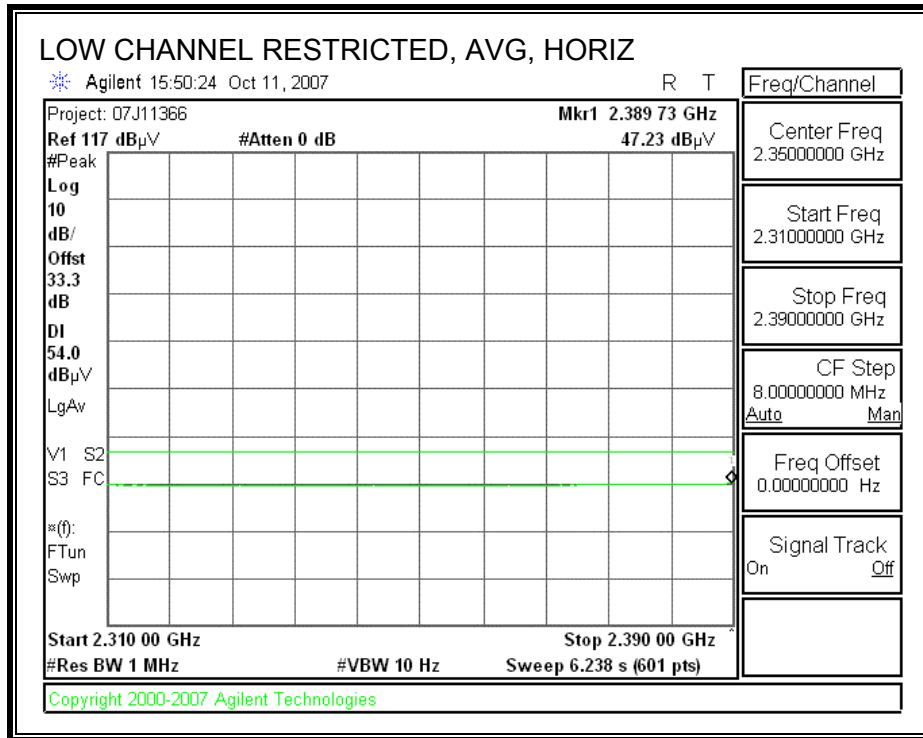


### 8.2.2. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

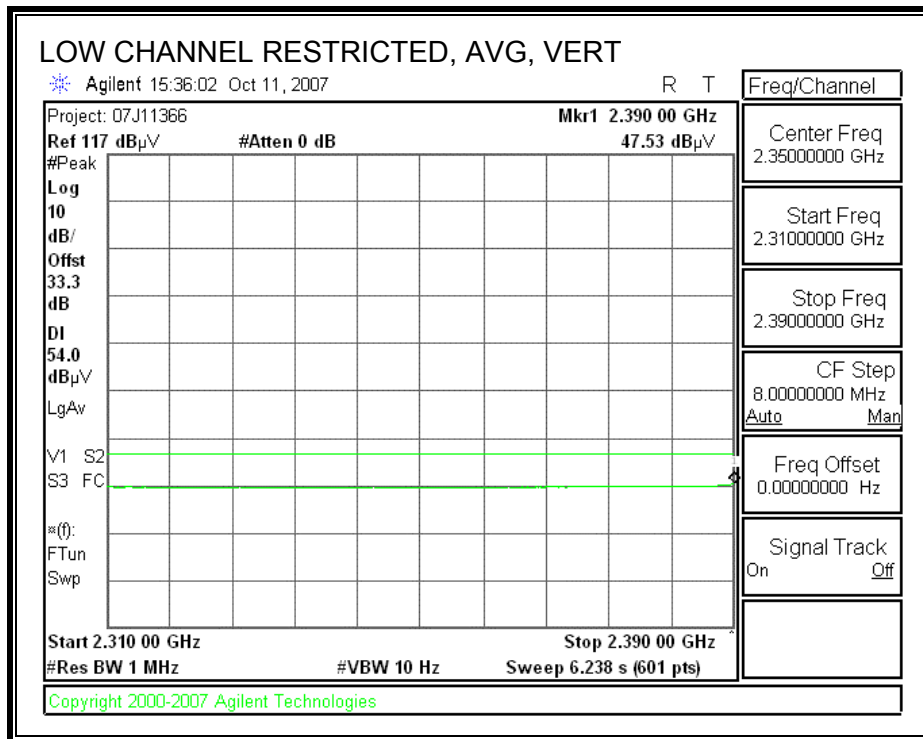
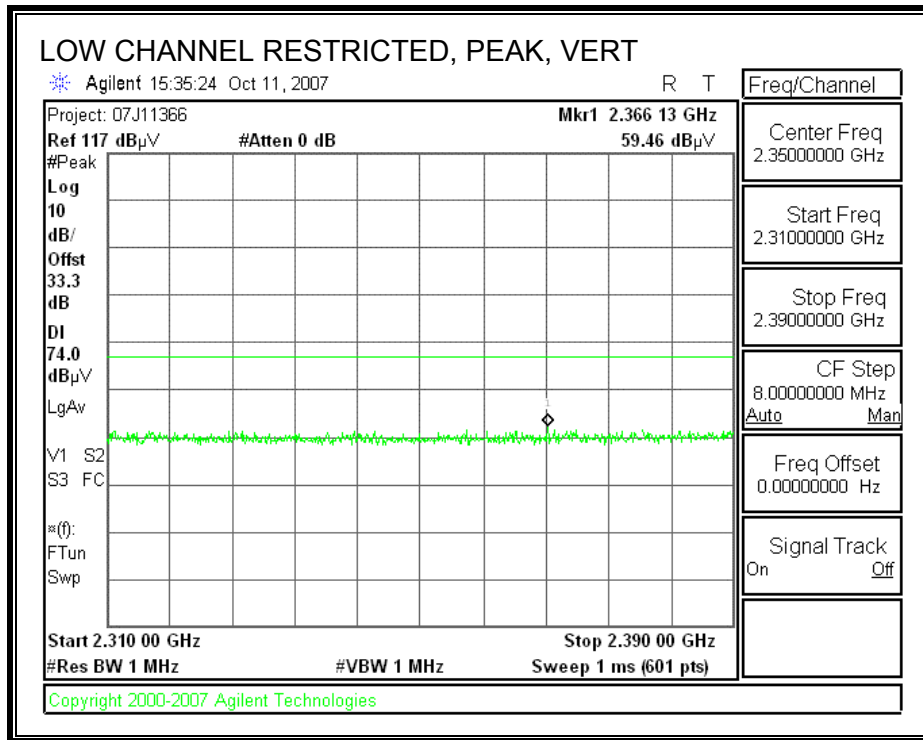
MONOPOLE 2.76 dBi ANTENNA

#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

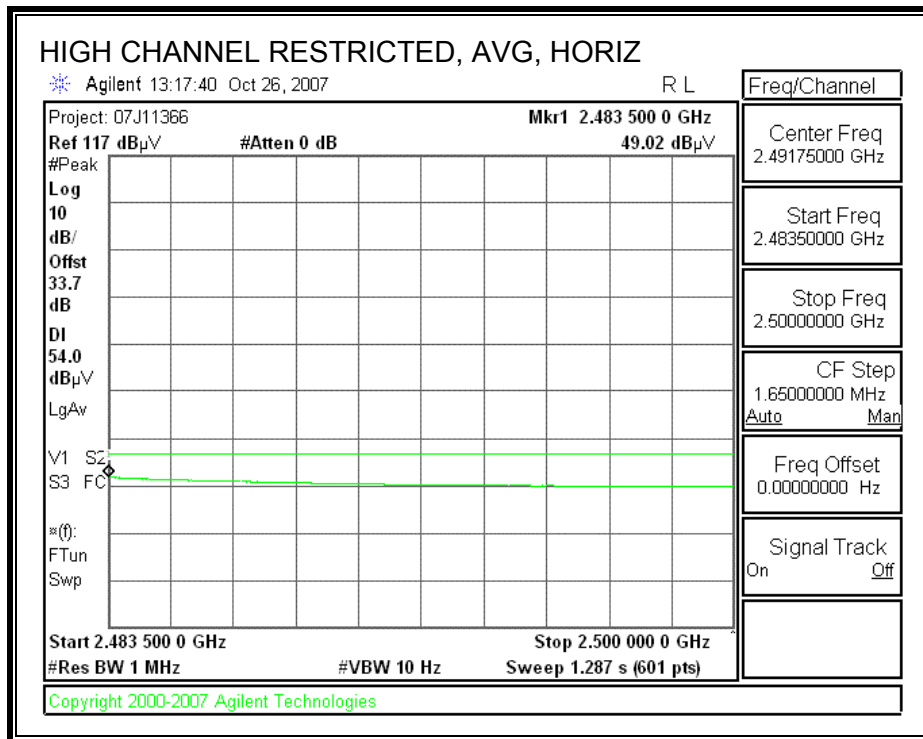
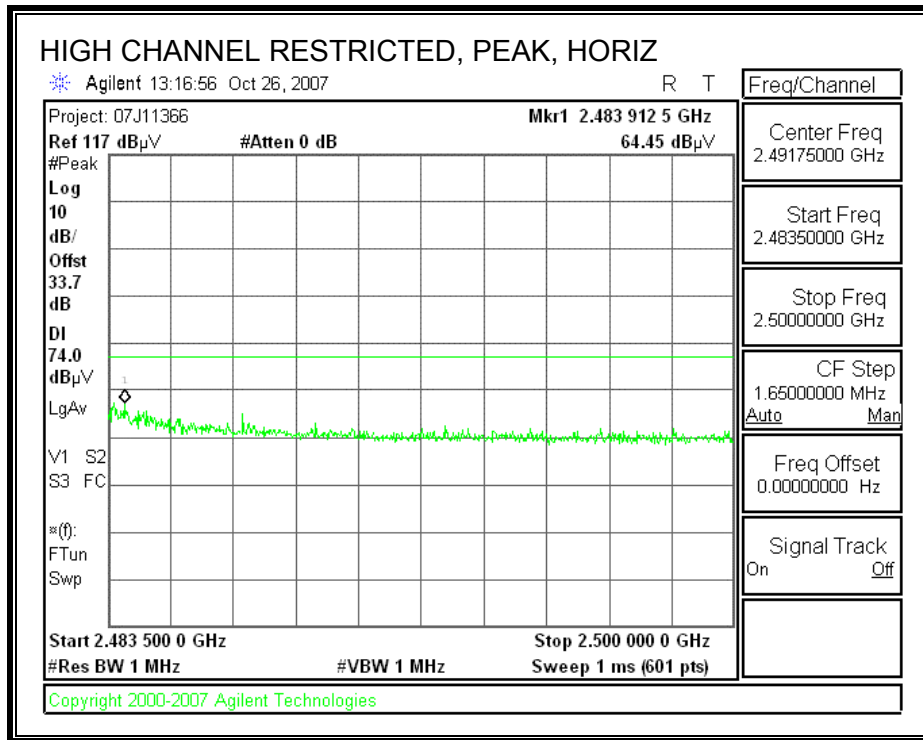




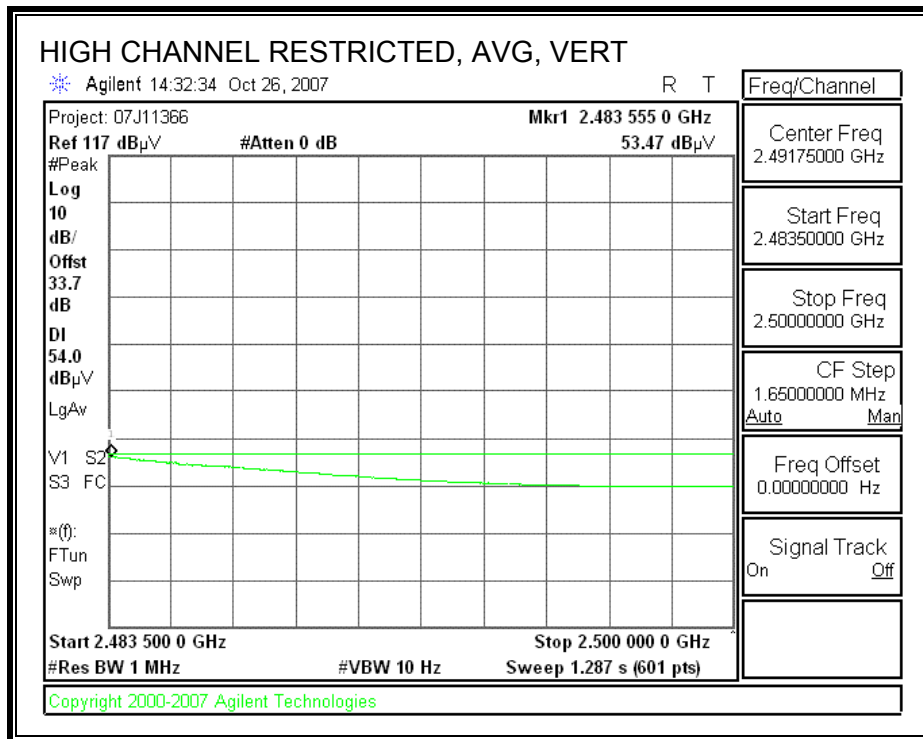
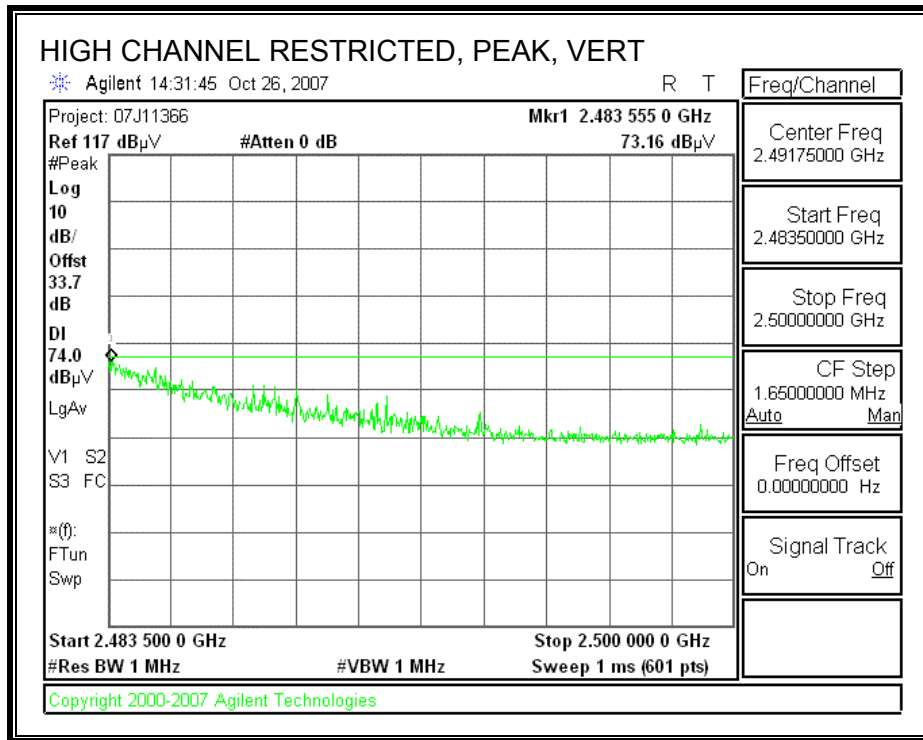
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

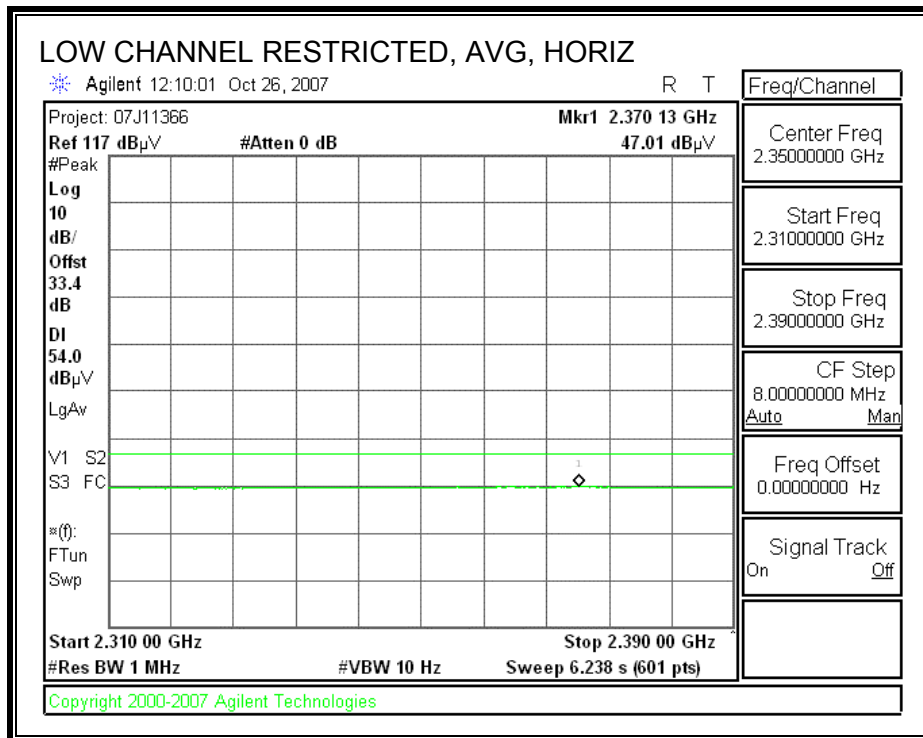
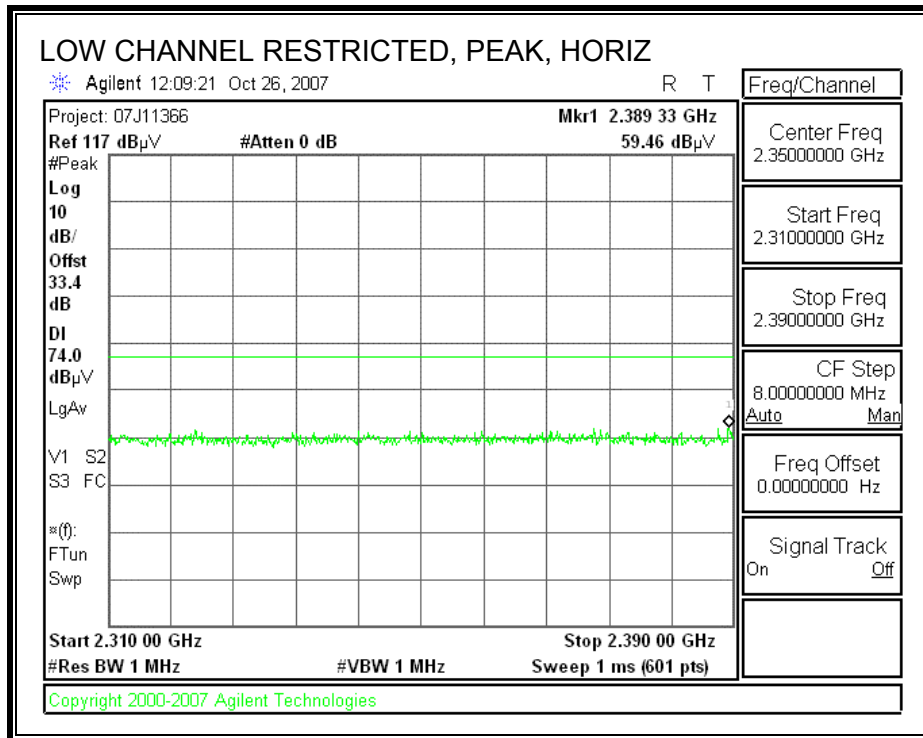


**HARMONICS AND SPURIOUS EMISSIONS**

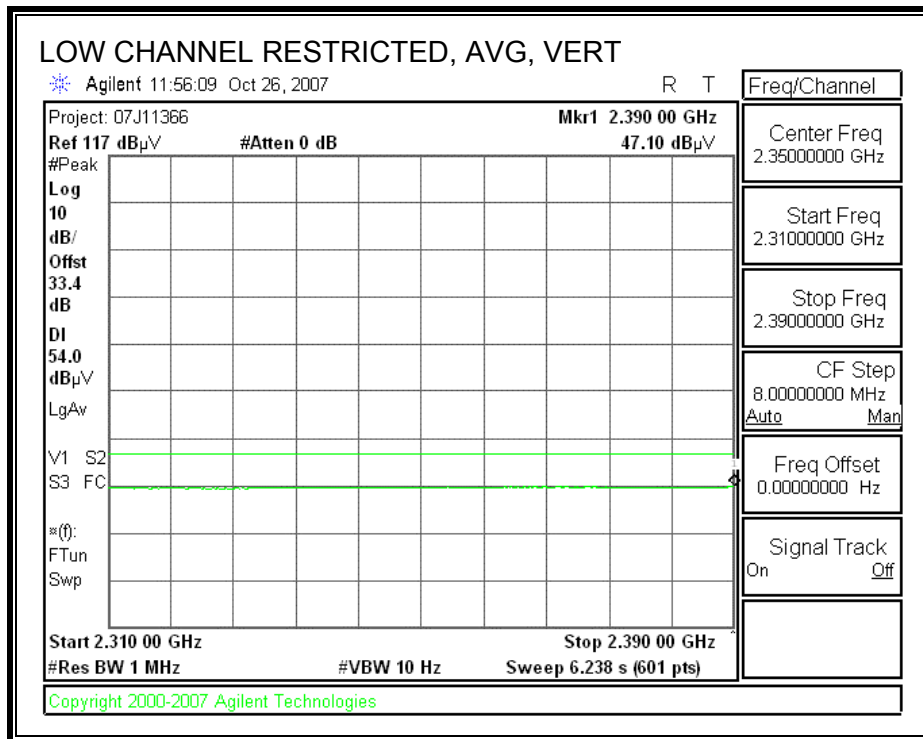
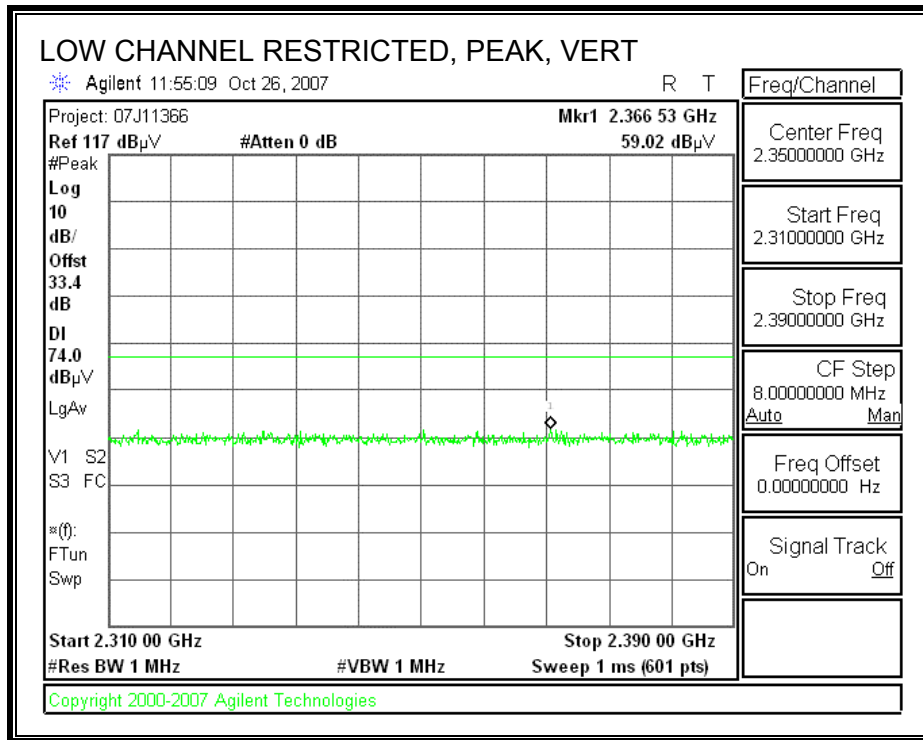
High Frequency Measurement																
Compliance Certification Services																
Company: Maruta Manufacturing Company, Ltd																
Project #: 07J11366																
Date: 10/11/07																
Test Engineer: Vien Tran																
Configuration: EUT with Monopole 2.76 dBi Antenna																
Mode: Tx 11g Mode																
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T120; S/N: 29310 @3m			T34 HP 8449B									FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter					
			Gordon 177080004			Chin 200354001			HPF_4.0GHz				Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz			
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
<b>LOW CHANNEL, 2412 MHz</b>																
4.824	3.0	48.4	36.6	33.7	3.5	-34.8	0.0	0.6	51.3	39.5	74	54	-22.7	-14.5	V	
4.824	3.0	43.7	30.1	33.7	3.5	-34.8	0.0	0.6	46.6	33.0	74	54	-27.4	-21.0	H	
<b>MID CHANNEL, 2442 MHz</b>																
4.884	3.0	51.4	37.0	33.8	3.5	-34.8	0.0	0.6	54.4	40.1	74	54	-19.6	-13.9	V	
7.326	3.0	48.0	35.1	35.2	4.1	-34.1	0.0	0.6	53.8	40.9	74	54	-20.2	-13.1	V	
4.884	3.0	49.3	34.8	33.8	3.5	-34.8	0.0	0.6	52.3	37.8	74	54	-21.7	-16.2	H	
7.326	3.0	48.0	35.1	35.2	4.1	-34.1	0.0	0.6	53.8	40.9	74	54	-20.2	-13.1	H	
<b>HI CHANNEL, 2472 MHz</b>																
4.944	3.0	53.2	39.5	33.8	3.5	-34.8	0.0	0.6	56.3	42.6	74	54	-17.7	-11.4	V	
7.416	3.0	44.5	31.9	35.2	4.1	-34.1	0.0	0.6	50.4	37.8	74	54	-23.6	-16.2	V	
4.944	3.0	48.5	35.3	33.8	3.5	-34.8	0.0	0.6	51.6	38.4	74	54	-22.4	-15.6	H	
7.416	3.0	44.1	32.5	35.2	4.1	-34.1	0.0	0.6	50.0	38.4	74	54	-24.0	-15.6	H	
No other emissions were detected above system noise floor																
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit							
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit							
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit							
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit							
CL	Cable Loss			HPF	High Pass Filter											

SLEEVE -0.73 dBi ANTENNA

**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

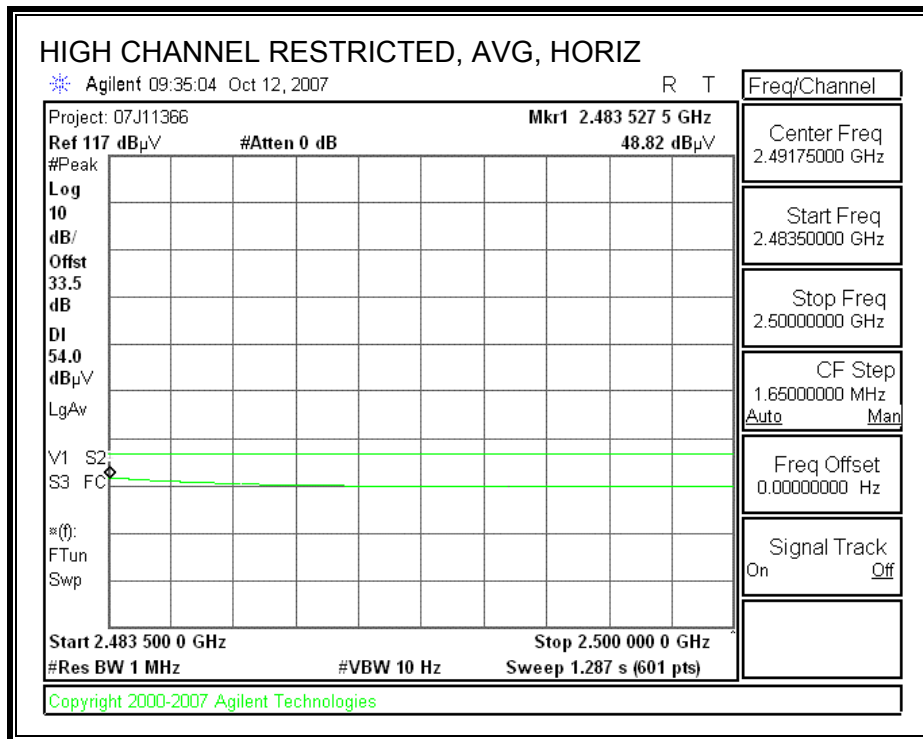
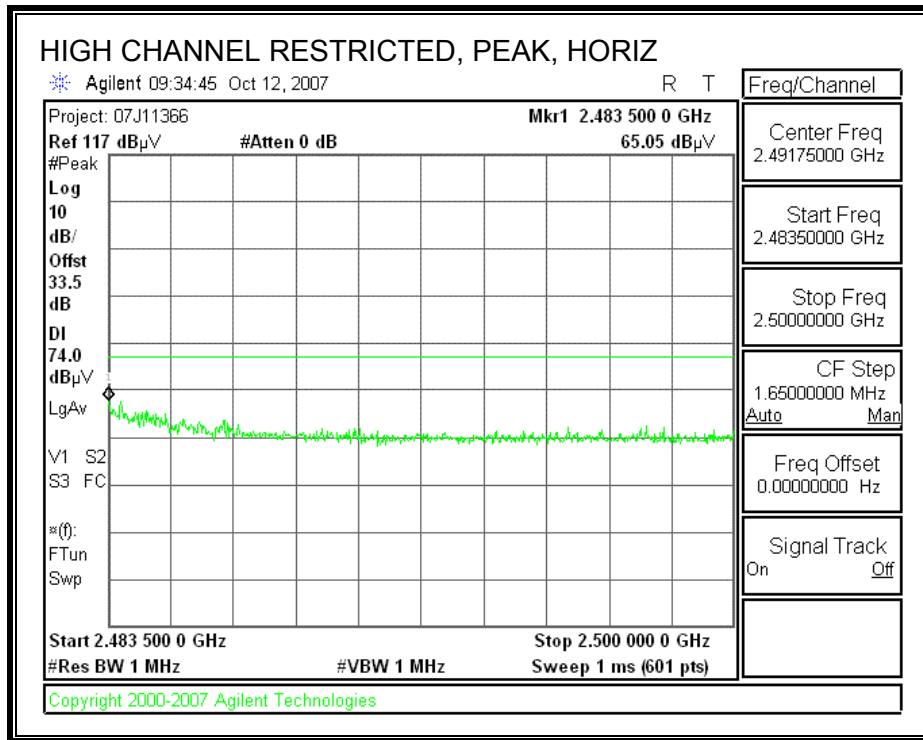


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

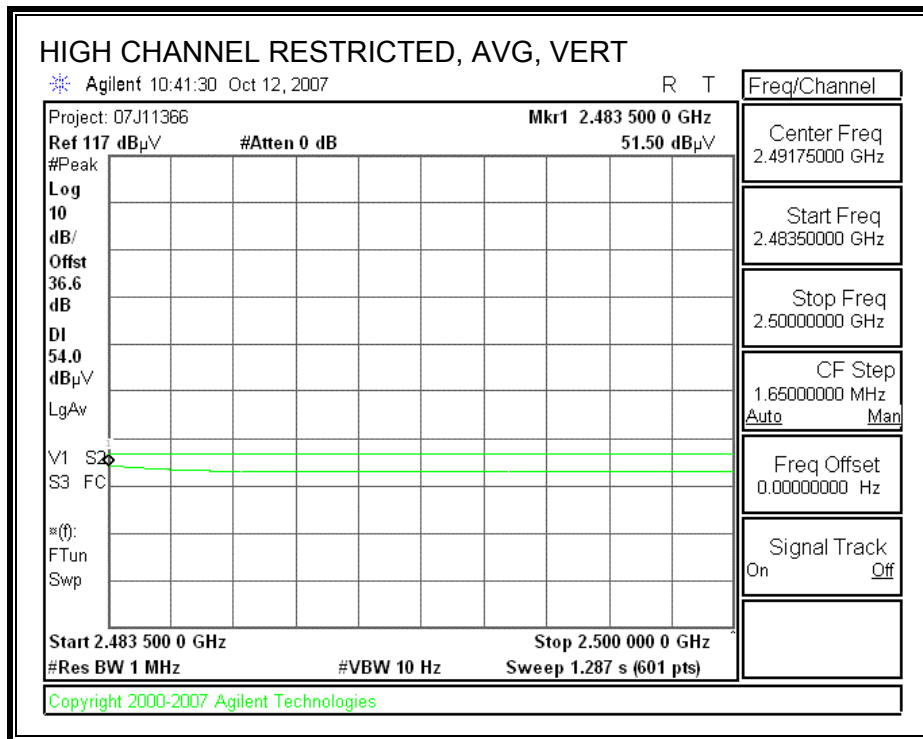
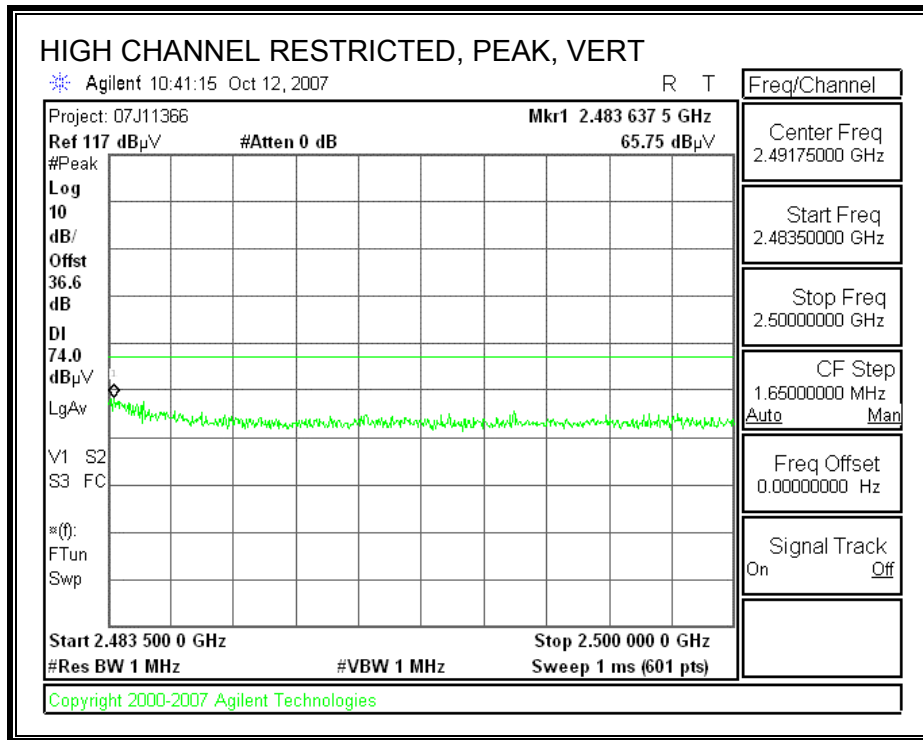




**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



**HARMONICS AND SPURIOUS EMISSIONS**

Compliance Certification Services, Fremont 5m Chamber

Company: Maruta Manufacturing Company, Ltd  
 Project #: 07J11366  
 Date: 10/26/2007  
 Test Engineer: Mengistu Mekuria  
 Configuration: EUT with Sleeve -0.73dBi Antenna  
 Mode: Tx 11g Mode

Test Equipment:

Horn 1-18GHz T60: S/N: 2238 @3m	Pre-amplifer 1-26GHz T145 Agilent 3008A005	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit FCC 15.209
Hi Frequency Cables		2 foot cable	3 foot cable	12 foot cable B-5m Chamber
		HPF HPF_4.0GHz	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>LOW CHANNEL, 2412 MHz</b>															
4.824	3.0	44.1	31.5	33.0	7.1	-34.8	0.0	0.6	50.0	37.3	74	54	-24.0	-16.7	V
7.236	3.0	42.3	29.5	35.4	8.6	-34.7	0.0	0.6	52.3	39.5	74	54	-21.7	-14.5	V
4.824	3.0	47.7	32.9	33.0	7.1	-34.8	0.0	0.6	53.6	38.8	74	54	-20.4	-15.2	H
7.236	3.0	43.4	29.5	35.4	8.6	-34.7	0.0	0.6	53.3	39.4	74	54	-20.7	-14.6	H
<b>MID CHANNEL, 2442 MHz</b>															
4.884	3.0	48.1	33.2	33.1	7.2	-34.9	0.0	0.6	54.1	39.2	74	54	-19.9	-14.8	V
7.326	3.0	43.3	30.5	35.5	8.7	-34.7	0.0	0.6	53.4	40.6	74	54	-20.6	-13.4	V
4.884	3.0	47.4	32.6	33.1	7.2	-34.9	0.0	0.6	53.4	38.6	74	54	-20.6	-15.4	H
7.326	3.0	42.9	29.9	35.5	8.7	-34.7	0.0	0.6	53.0	40.1	74	54	-21.0	-13.9	H
<b>HI CHANNEL, 2472 MHz</b>															
4.944	3.0	50.3	35.2	33.1	7.2	-34.9	0.0	0.6	56.4	41.3	74	54	-17.6	-12.7	V
7.416	3.0	43.3	30.4	35.6	8.7	-34.6	0.0	0.6	53.6	40.7	74	54	-20.4	-13.3	V
4.944	3.0	50.0	35.1	33.1	7.2	-34.9	0.0	0.6	56.1	41.2	74	54	-17.9	-12.8	H
7.416	3.0	43.6	30.5	35.6	8.7	-34.6	0.0	0.6	53.9	40.7	74	54	-20.1	-13.3	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

### 8.3. RECEIVER ABOVE 1 GHz

#### 8.3.1. RECEIVER ABOVE 1 GHz IN THE 2.4 GHz BAND

#### MONOPOLE 2.76 dBi ANTENNA

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Murata Manufacturing Co., Ltd.  
 Project #: 07J11366  
 Date: 10/28/2007  
 Test Engineer: Mengistu Mekuria  
 Configuration: EUT With Monopole Antenna and Support Equipment  
 Mode: Rx Mode

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T145 Agilent 3008A005f			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		

**Peak Measurements**  
 RBW=VBW=1MHz  
**Average Measurements**  
 RBW=1MHz, VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.060	3.0	51.6	43.1	25.6	3.3	-36.1	0.0	0.0	44.4	35.8	74	54	-29.6	-18.2	V
1.240	3.0	50.5	39.4	26.0	3.5	-36.0	0.0	0.0	44.1	33.0	74	54	-29.9	-21.0	V
1.330	3.0	49.3	40.9	26.3	3.7	-35.9	0.0	0.0	43.3	34.9	74	54	-30.7	-19.1	V
1.510	3.0	49.8	41.2	26.7	3.9	-35.8	0.0	0.0	44.6	36.1	74	54	-29.4	-17.9	V
1.060	3.0	57.5	52.5	25.6	3.3	-36.1	0.0	0.0	50.3	45.3	74	54	-23.7	-8.7	H
1.240	3.0	52.4	45.3	26.0	3.5	-36.0	0.0	0.0	46.0	38.9	74	54	-28.0	-15.1	H
1.330	3.0	52.4	44.8	26.3	3.7	-35.9	0.0	0.0	46.5	38.8	74	54	-27.5	-15.2	H
1.510	3.0	51.5	43.5	26.7	3.9	-35.8	0.0	0.0	46.3	38.3	74	54	-27.7	-15.7	H
1.684	3.0	49.3	40.1	27.1	4.1	-35.6	0.0	0.0	44.9	35.7	74	54	-29.1	-18.3	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

**SLEEVE -0.73 dBi ANTENNA**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Murata Manufacturing Co., Ltd.  
 Project #: 07J11366  
 Date: 10/28/2007  
 Test Engineer: Mengistu Mekuria  
 Configuration: EUT With Sleeve Antenna and Support Equipment  
 Mode: Rx Mode

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T145 Agilent 3008A005			RX RSS 210

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	
		B-5m Chamber			Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.060	3.0	50.2	42.7	25.6	3.3	-36.1	0.0	0.0	43.0	35.4	74	54	-31.0	-18.6	V
1.240	3.0	49.1	39.9	26.0	3.5	-36.0	0.0	0.0	42.7	33.5	74	54	-31.3	-20.5	V
1.330	3.0	49.1	40.2	26.3	3.7	-35.9	0.0	0.0	43.1	34.2	74	54	-30.9	-19.8	V
1.510	3.0	49.7	40.3	26.7	3.9	-35.8	0.0	0.0	44.5	35.1	74	54	-29.5	-18.9	V
1.060	3.0	56.2	50.5	25.6	3.3	-36.1	0.0	0.0	49.0	43.3	74	54	-25.0	-10.7	H
1.240	3.0	51.9	44.5	26.0	3.5	-36.0	0.0	0.0	45.5	38.1	74	54	-28.5	-15.9	H
1.330	3.0	51.8	44.2	26.3	3.7	-35.9	0.0	0.0	45.8	38.2	74	54	-28.2	-15.8	H
1.510	3.0	51.9	43.5	26.7	3.9	-35.8	0.0	0.0	46.8	38.3	74	54	-27.2	-15.7	H
1.684	3.0	48.2	39.0	27.1	4.1	-35.6	0.0	0.0	43.8	34.6	74	54	-30.2	-19.4	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

### 8.4. WORST-CASE BELOW 1 GHz

#### MONOPOLE 2.76 dBi ANTENNA

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

##### HORIZONTAL



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 11 File#: 07J11366\_EMI.EMI Date: 10-29-2007 Time: 02:05:44

Condition: FCC CLASS-B HORIZONTAL  
Engineer: : Mengistu Mekuria  
Company: : Murata Manufacturing Co., Ltd.  
Project #: : 07J11366  
Test Configuration: : EUT with Monopole Antenna and Support  
Equipment  
Mode of operation: : TX Mode (Worst Case)  
Test Target: : FCC Class B

Page: 1

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV/m	dB	dBuV/m	dB	
1	80.440	48.47	29.14	-19.33	40.00	-10.86	Peak
2	121.180	43.55	30.31	-13.24	43.50	-13.19	Peak
3	230.790	54.00	39.17	-14.83	46.00	-6.83	Peak
4	266.680	54.20	40.65	-13.55	46.00	-5.35	Peak
5	710.940	39.32	35.99	-3.33	46.00	-10.01	Peak

**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 12 File#: 07J11366\_EMI.EMI Date: 10-29-2007 Time: 02:06:57

Condition: FCC CLASS-B VERTICAL  
Engineer: : Mengistu Mekuria  
Company: : Murata Manufacturing Co., Ltd.  
Project #: : 07J11366  
Test Configuration: : EUT with Monopole Antenna and Support  
: Equipment  
Mode of operation: : TX Mode (Worst Case)  
Test Target: : FCC Class B

Page: 1

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHZ	dBuV	dBuV/m	dB	dBuV/m	dB	
1	67.830	55.92	36.68	-19.24	40.00	-3.32	Peak
2	179.380	52.58	37.62	-14.96	43.50	-5.88	Peak
3	230.790	56.09	41.26	-14.83	46.00	-4.74	Peak
4	667.290	39.10	35.00	-4.10	46.00	-11.00	Peak
5	710.940	36.66	33.33	-3.33	46.00	-12.67	Peak

SLEEVE -0.73 dBi ANTENNA

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 10 File#: 07J11366\_EMI.EMI Date: 10-29-2007 Time: 02:04:27

Condition: FCC CLASS-B HORIZONTAL  
Engineer: : Mengistu Mekuria  
Company: : Murata Manufacturing Co., Ltd.  
Project #: : 07J11366  
Test Configuration: : EUT with Sleeve Antenna and Support  
: Equipment  
Mode of operation: : TX Mode (Worst Case)  
Test Target: : FCC Class B

Page: 1

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV/m	dB	dBuV/m	dB	
1	90.140	46.36	26.93	-19.43	43.50	-16.57	Peak
2	145.430	42.15	28.61	-13.54	43.50	-14.89	Peak
3	230.790	55.21	40.38	-14.83	46.00	-5.62	Peak
4	444.190	44.23	35.53	-8.70	46.00	-10.47	Peak
5	710.940	39.32	35.99	-3.33	46.00	-10.01	Peak



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 9 File#: 07J11366\_EMI.EMI Date: 10-29-2007 Time: 02:01:08

Condition: FCC CLASS-B VERTICAL  
Engineer: : Mengistu Mekuria  
Company: : Murata Manufacturing Co., Ltd.  
Project #: : 07J11366  
Test Configuration: : EUT with Sleeve Antenna and Support  
Equipment  
Mode of operation: : TX Mode (Worst Case)  
Test Target: : FCC Class B

Page: 1

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHZ	dBuV	dBuV/m	dB	dBuV/m	dB	
1	67.830	54.83	35.59	-19.24	40.00	-4.41	Peak
2	221.090	57.26	42.14	-15.12	46.00	-3.86	Peak
3	371.440	48.69	38.16	-10.53	46.00	-7.84	Peak
4	664.380	38.02	33.87	-4.15	46.00	-12.13	Peak
5	974.780	35.81	35.05	-0.76	54.00	-18.95	Peak

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

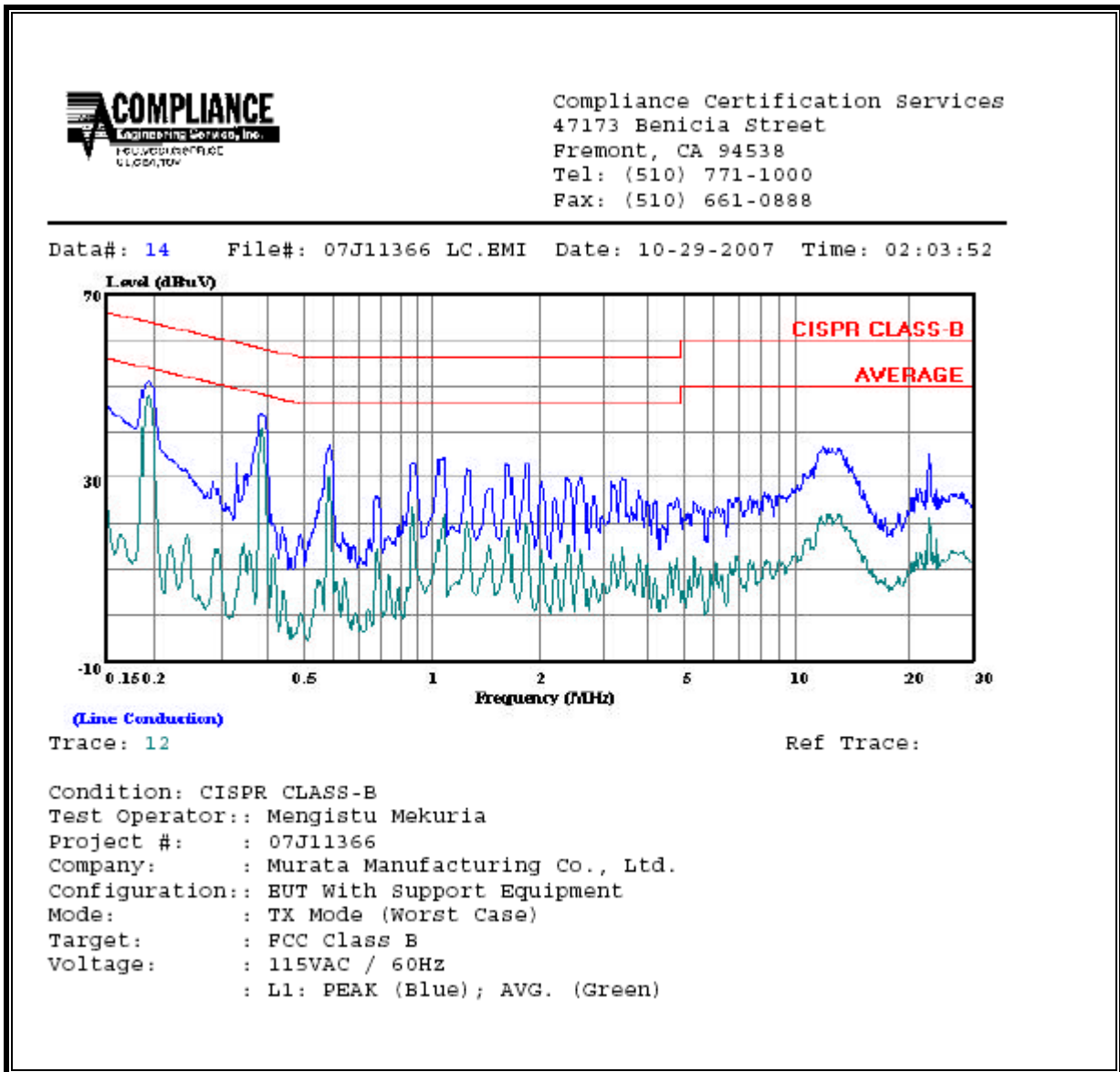
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

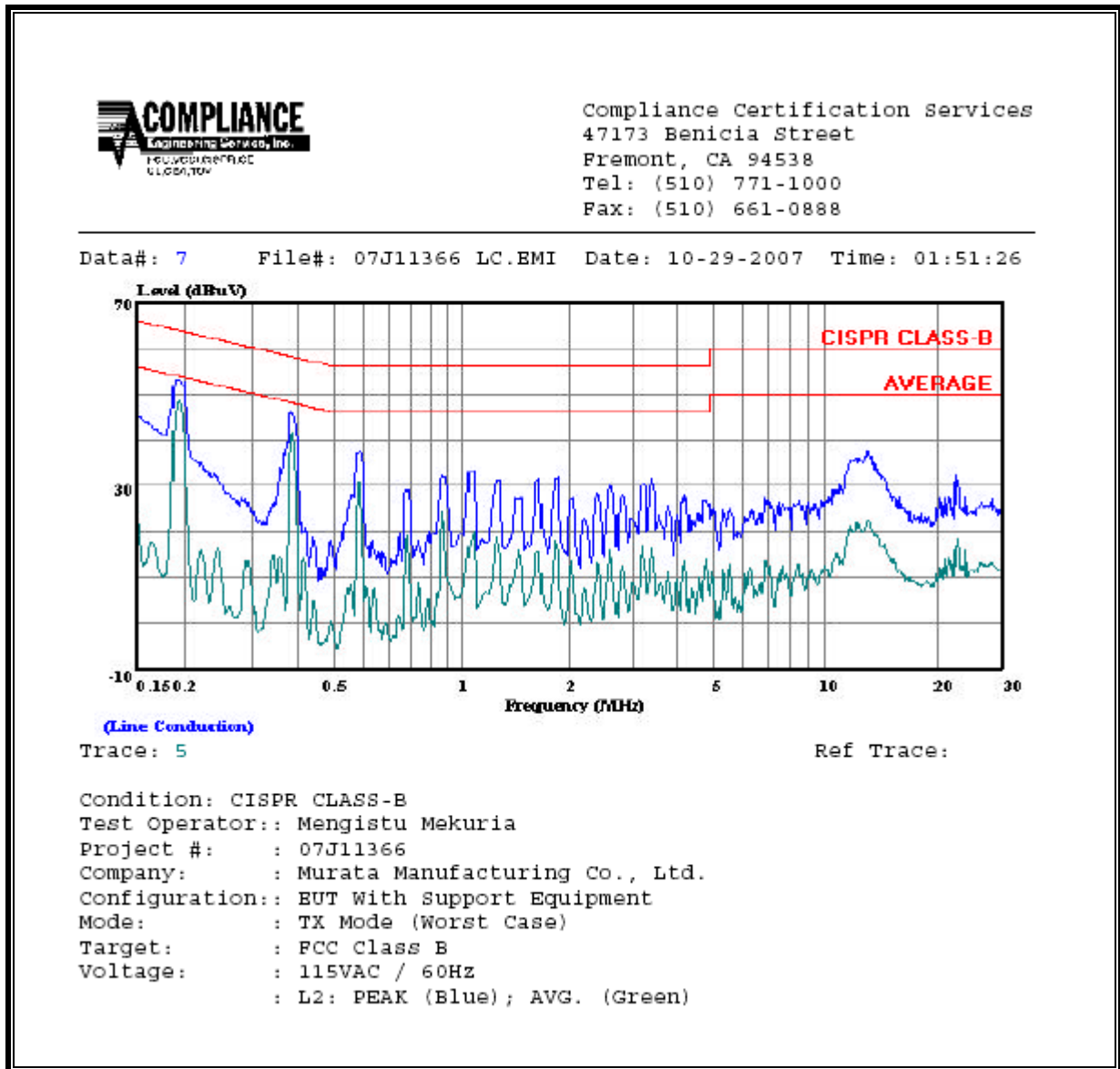
**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.19	51.06	--	47.81	0.00	63.91	53.91	-12.85	-6.10	L1
0.39	43.92	--	40.24	0.00	58.09	48.09	-14.17	-7.85	L1
0.59	37.00	--	30.13	0.00	56.00	46.00	-19.00	-15.87	L1
0.19	53.05	--	48.49	0.00	63.91	53.91	-10.86	-5.42	L2
0.39	46.00	--	41.43	0.00	58.09	48.09	-12.09	-6.66	L2
0.59	37.56	--	30.75	0.00	56.00	46.00	-18.44	-15.25	L2
6 Worst Data									

**LINE 1 RESULTS**



**LINE 2 RESULTS**



## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**IC RULES**

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5  
 Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> <sup>1.2</sup>
150 000–300 000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616 000 / <i>f</i> <sup>1.2</sup>

\* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## **CALCULATIONS**

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm<sup>2</sup> is converted to units of W/m<sup>2</sup> by multiplying by a factor of 10.



**LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm<sup>2</sup>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

**RESULTS**

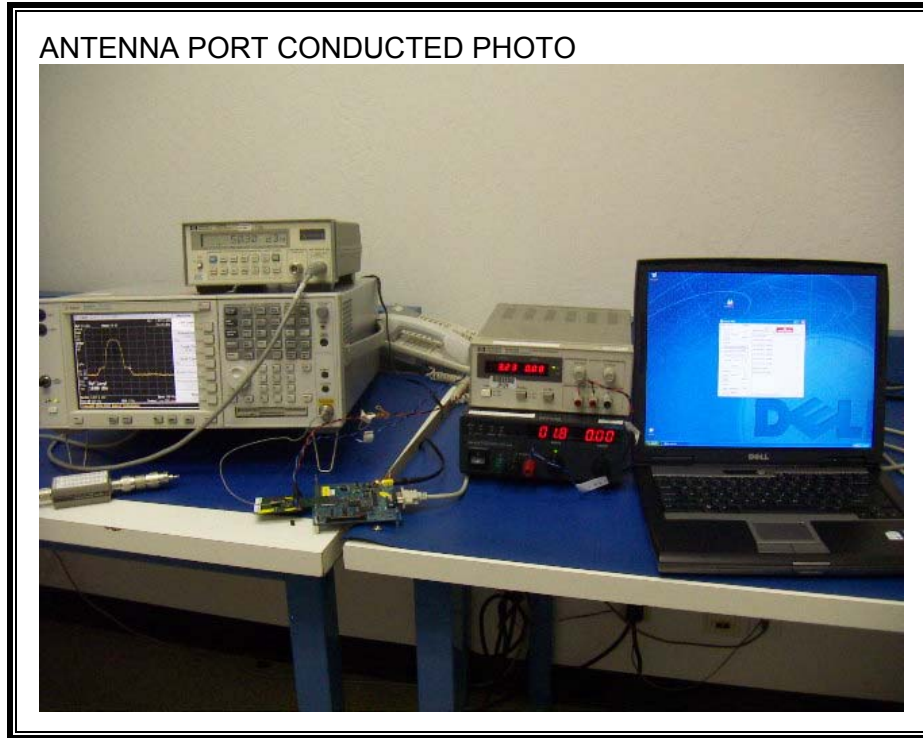
(MPE distance equals 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm <sup>2</sup> )	IC Power Density (W/m <sup>2</sup> )
WLAN	2.4 GHz	20.0	4.89	2.76	0.00	0.01

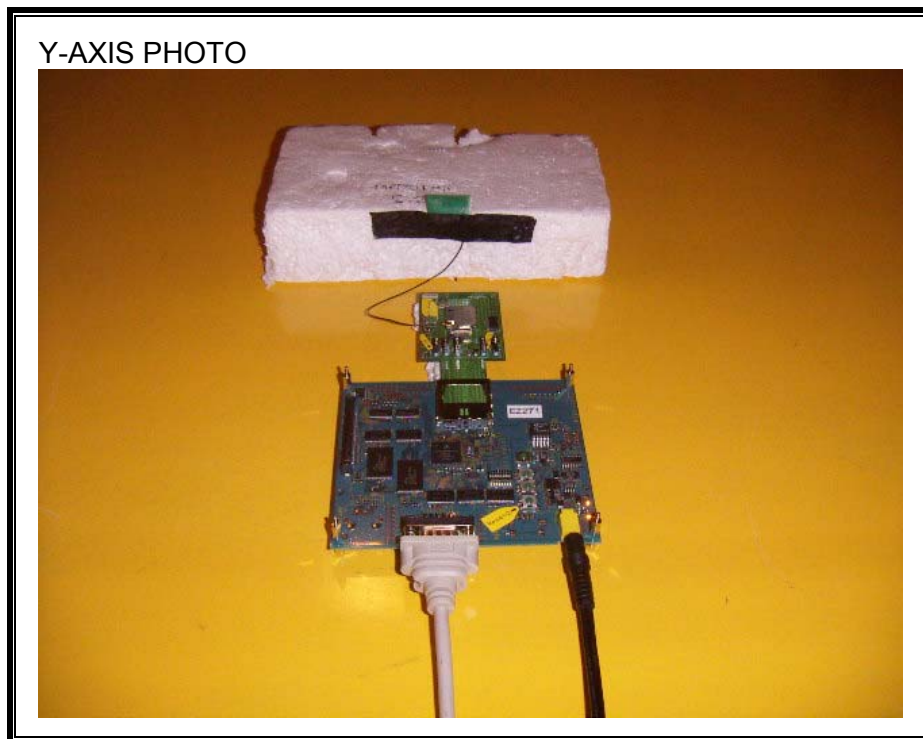
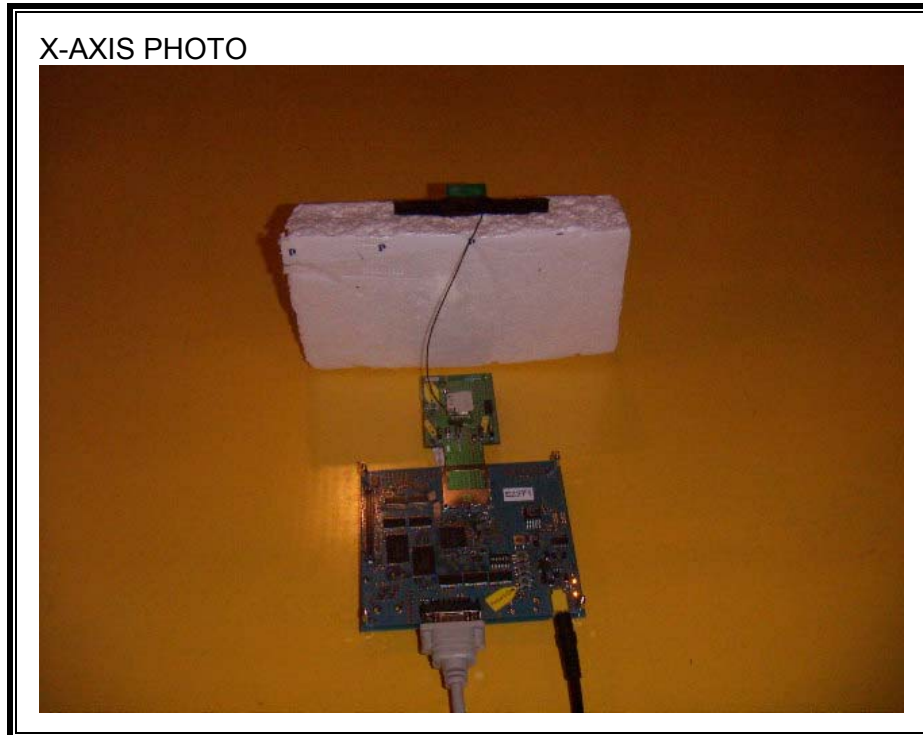
NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

## 11. SETUP PHOTOS

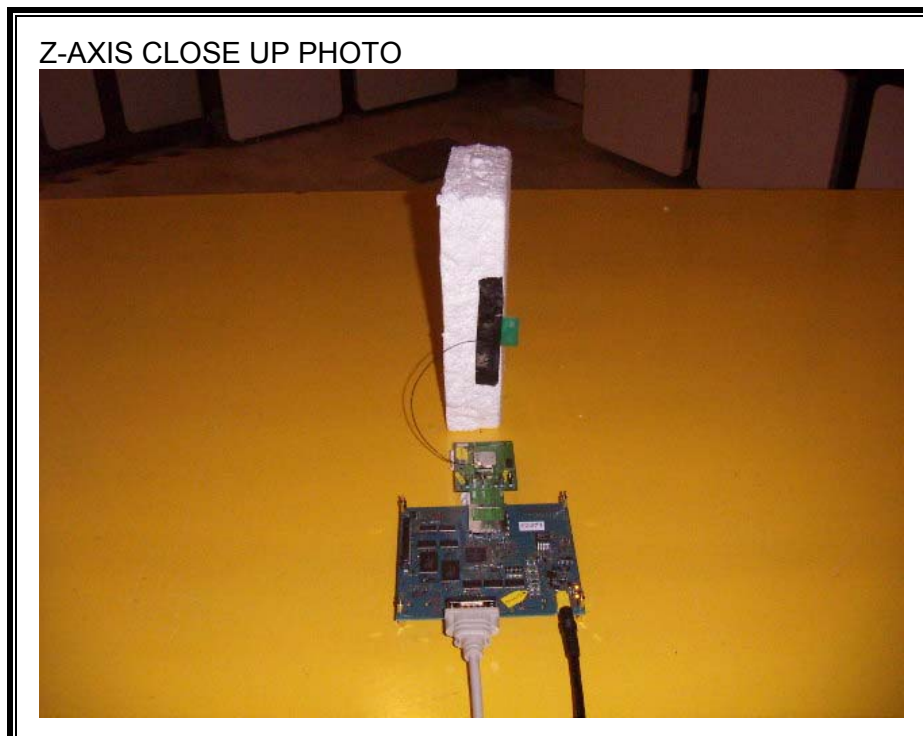
### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



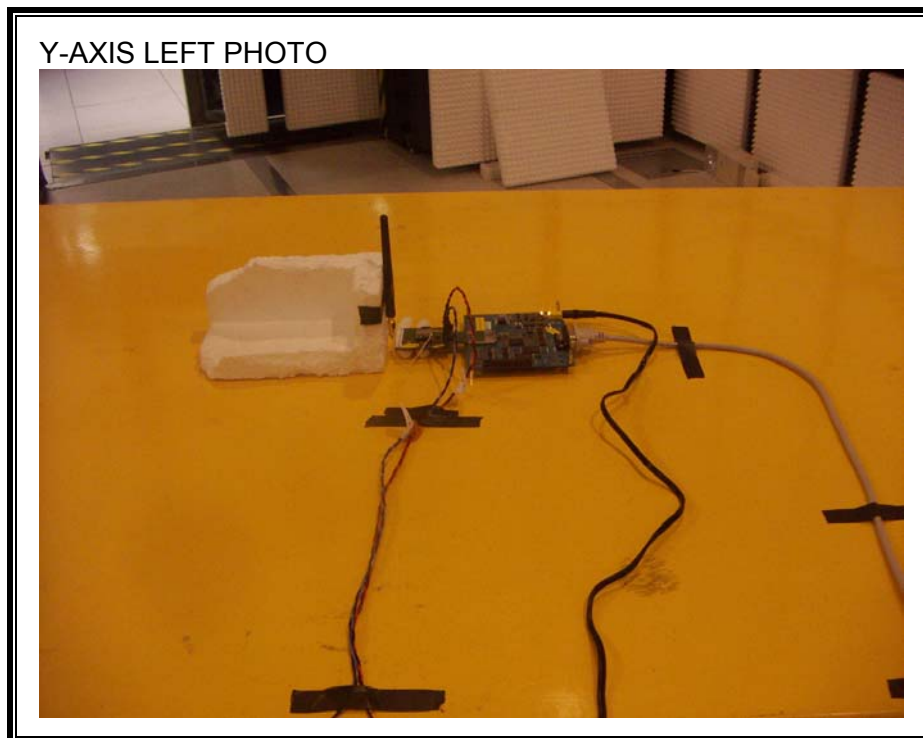
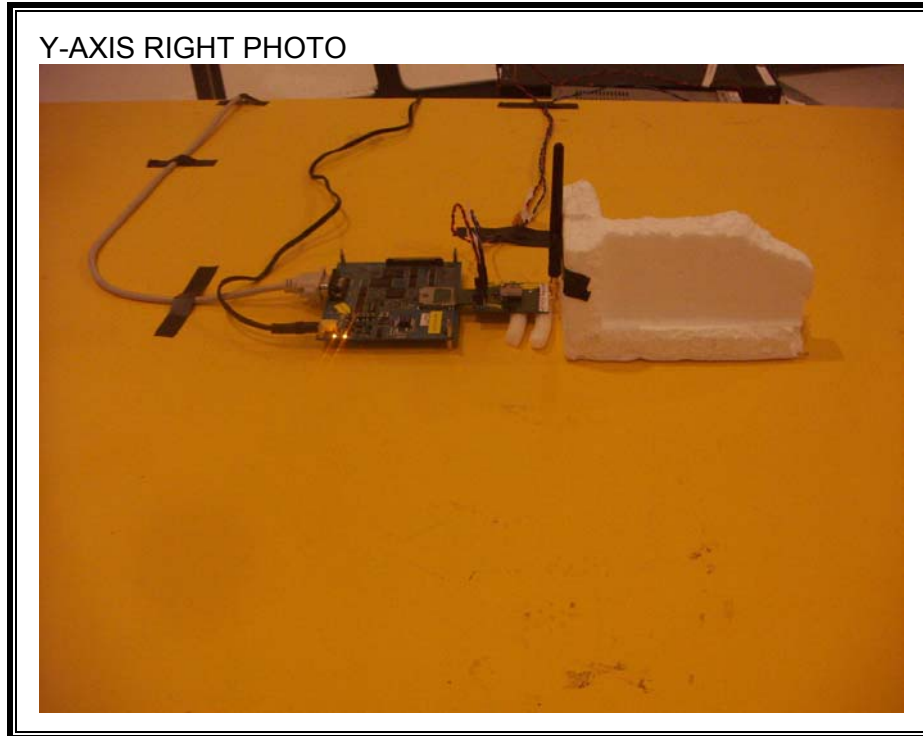
**RADIATED RF MEASUREMENT SETUP**  
**SLEEVE -0.73 dBi ANTENNA**

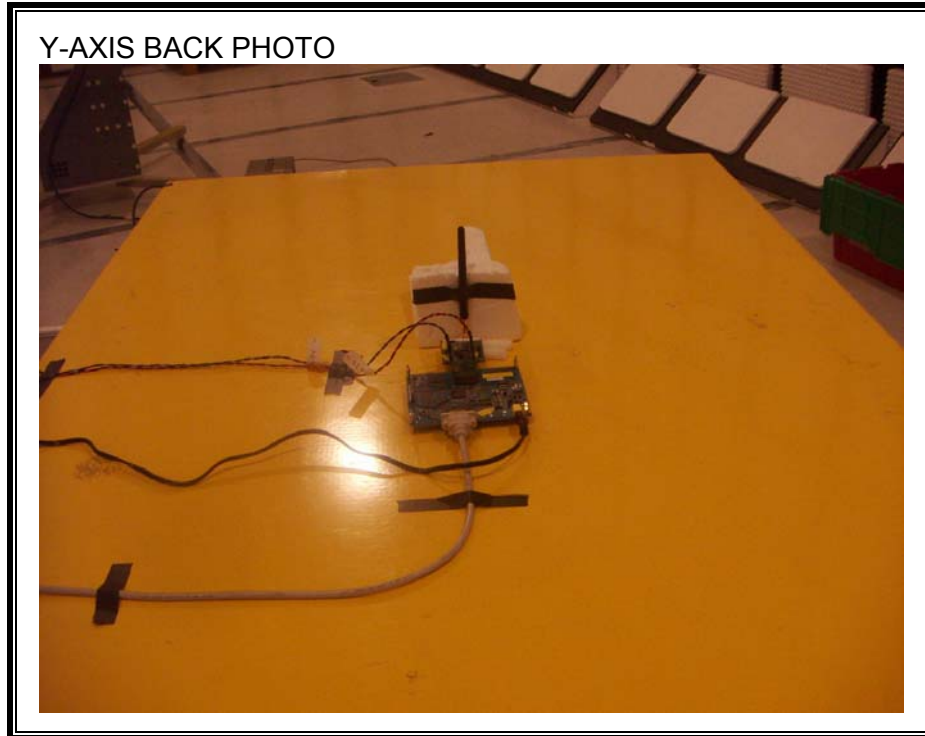


WORST CONFIGURATION



**MONOPOLE 2.67 dBi ANTENNA**







**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



**END OF REPORT**